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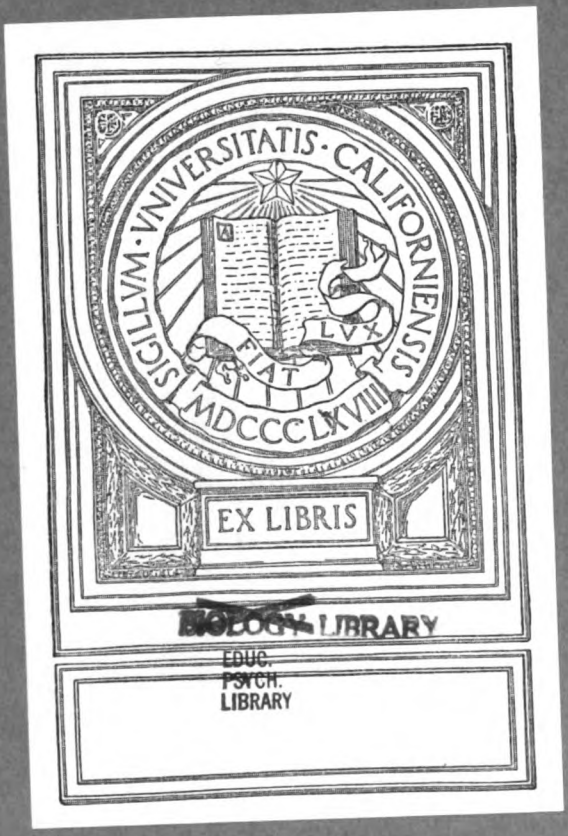

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THE JOURNAL
OF
MENTAL SCIENCE

(THE BRITISH JOURNAL OF PSYCHIATRY

BY AUTHORITY OF
THE ROYAL MEDICO-PSYCHOLOGICAL ASSOCIATION

EDITOR-IN-CHIEF
G. W. T. H. FLEMING

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AND WITH THE ASSISTANCE OF

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VOL. XCI

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" In adopting our title of the *Journal of Mental Science, published by authority of the Medico-Psychological Association*, we profess that we cultivate in our pages mental science of a particular kind, namely, such mental science as appertains to medical men who are engaged in the treatment of the insane. But it has been objected that the term mental science is inapplicable, and that the term mental physiology or mental pathology, or psychology, or psychiatry (a term much affected by our German brethren), would have been more correct and appropriate; and that, moreover, we do not deal in mental science, which is properly the sphere of the aspiring metaphysical intellect. If mental science is strictly synonymous with metaphysics, these objections are certainly valid; for although we do not eschew metaphysical discussion, the aim of this JOURNAL is certainly bent upon more attainable objects than the pursuit of those recondite inquiries which have occupied the most ambitious intellects from the time of Plato to the present, with so much labour and so little result. But while we admit that metaphysics may be called one department of mental science, we maintain that mental physiology and mental pathology are also mental science under a different aspect. While metaphysics may be called speculative mental science, mental physiology and pathology, with their vast range of inquiry into insanity, education, crime, and all things which tend to preserve mental health, or to produce mental disease, are not less questions of mental science in its practical, that is in its sociological point of view. If it were not unjust to high mathematics to compare it in any way with abstruse metaphysics, it would illustrate our meaning to say that our practical mental science would fairly bear the same relation to the mental science of the metaphysicians as applied mathematics bears to the pure science. In both instances the aim of the pure science is the attainment of abstract truth; its utility, however, frequently going no further than to serve as a gymnasium for the intellect. In both instances the mixed science aims at, and, to a certain extent, attains immediate practical results of the greatest utility to the welfare of mankind; we therefore maintain that our JOURNAL is not inaptly called the *Journal of Mental Science*, although the science may only attempt to deal with sociological and medical inquiries, relating either to the preservation of the health of the mind or to the amelioration or cure of its diseases; and although not soaring to the height of abstruse metaphysics, we only aim at such metaphysical knowledge as may be available to our purposes, as the mechanician uses the formularies of mathematics. This is our view of the kind of mental science which physicians engaged in the grave responsibility of caring for the mental health of their fellow-men may, in all modesty, pretend to cultivate; and while we cannot doubt that all additions to our certain knowledge in the speculative department of the science will be great gain, the necessities of duty and of danger must ever compel us to pursue that knowledge which is to be obtained in the practical departments of science with the earnestness of real workmen. The captain of a ship would be none the worse for being well acquainted with the higher branches of astronomical science, but it is the practical part of that science as it is applicable to navigation which he is compelled to study."—*Sir J. C. Bucknill, M.D., F.R.S.* (*Journ. Ment. Sci.*, vol. vii, 1861, p. 137).

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No. 382 [NEW SERIES No. 346.] JANUARY, 1945. VOL. XCI

Part I.—Original Articles.

SERUM GONADOTROPHIN AND TESTIS BIOPSY IN THE TREATMENT OF SCHIZOPHRENIA.

By R. E. HEMPHILL, M.A., M.D., D.P.M.,
Medical Superintendent, Bristol Mental Hospital; and

M. REISS, M.D., D.Sc.Prague,
Director of the Endocrinological Department, Burden Neurological Institute.

SEX hormone deficiency in schizophrenia has been suggested by the usual appearance of the psychosis in adolescence, the not infrequent somatic abnormalities, aberration of libido with often its eventual extinction, and, histologically, by the suggestive though not entirely accepted work of Mott (1919), Lewis (1923) and certain others implicating the testis. Accordingly, many workers have treated schizophrenia with sex hormone preparations empirically but without specific endocrine indications. The reported results have been inconsistent and disappointing. In this respect our experience with various hormones has been similar to that of others. The need for a physiological test to establish a diagnosis of endocrine deficiency and control appropriate therapy has been keenly felt. Values for the normal excretion of sex hormones at various stages during adolescence are not as yet established; estimations are not a practical possibility on a large scale, and with the exception of one excretion product of steroid metabolism with an androgenic action, namely, 17-keto-steroids, demand a biological technique. Testis biopsy, described by Charny (1940) and Lane Roberts (1939) is, therefore, a valuable diagnostic procedure, and possibly not without some therapeutic value. We have already described and classified a striking pathology of the testis in schizophrenia from studying biopsy material (Hemphill *et al.*, 1940). The special features were atrophy of seminiferous epithelium, failure of spermatogenesis, thickening and hyalinization of the basement membrane and collapse or shrinkage of many tubules. We were unable to note consistent absence or marked reduction of interstitial elements in cases where secondary sexual characteristics were well developed, although the work of Mott (1919) drew particular attention to failure of internal secretion. The interpretation of the pathology is, of course, uncertain, but the atrophy of spermatogenetic structures suggested that there was a lack of normal or adequate gonadotrophic hormone necessary for the maintenance of spermatogenesis and the activity of the testis as a generative organ. For this reason we treated cases with gonadotrophic hormone of pregnant mare's serum (gestyl). This follicle-stimulating hormone is believed, in the male, to promote spermatogenesis. Treatment was dictated by the histology of the biopsy specimen. Gestyl was administered in 800 to 1,000 unit doses daily for variable periods of up to 48 days. Anti-hormones were tested for at the completion of treatment in the last series of cases, and further biopsies were made as a check-up for physiological efficacy.

In this paper we present and describe the effect of intensive treatment on the mental state and gonad function in a selected series of male and four female patients.

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Case Material.

The case material and results are summarized in the following table:

TABLE I.

Name.	Age.	Dosage.	Testis. Before.	Testis. After.	Weight.	Mental effect.
Male:						
F. C—	19	800 × 34	Atr. +	I.	+ 3	Recovered.
F. C—	21	1,000 × 40	,, +	—	+ 4	,,
R. P—	19	1,000 × 48	,, +.	I.	+ 16	,,
S. J—	19	800 × 48	,, +	I.	+ 6	Change.
D. H—	20	1,000 × 48	,, +.	—	—	,,
C. F—	32	1,000 × 48	,, +.	I.	+ 4	,,
C. A—	21	1,000 × 48	,, +	I.	+ 4	,,
R. F—	19	800 × 20	,, +.	I.	—	,,
S. P—	28	1,000 × 48	Sl. atr.	N.C.	+ 3	,,
H. H—	32	800 × 20	Atr. +.	—	—	No change.
H. B—	32	800 × 20	,, +.	I.	—	,,
H. B—*	34	1,000 × 48	,,	I.	—	,,
A. K—	38	1,000 × 48	,,	N.C.	—	,,
D. T—	26	1,000 × 48	,, +	,,	—	,,
P. M—	24	1,000 × 48	Sl. atr.	,,	—	,,
G. V—	42	1,000 × 48	Atr. +	,,	—	,,
P. F—	20	1,000 × 48	Nor.	,,	— 6	Worse.
E. D—	18	800 × 20	Atr. +.	—	— 4	,,
E. H—*	23	1,000 × 24	,, +.	N.C.	— 8	,,
T. W—	18	1,000 × 48	,, +.	I.	— 8	,,
			Menses.			
Female.						
D. V. B—	20	800 × 21	—	Nor.	—	Recovered.
I. W. H—	34	800 × 21	—	,,	—	Change.
D. C—	25	800 × 21	—	,,	—	,,
O. S—	25	800 × 21 (twice)	—	N.C.	—	No change.

* = Anti-hormone in blood after treatment; Atr. = Atrophy; I. = Improved; N.C. = No change. Nor. = Normal.

Males.

Recovered.

F. C—, hebephrenia, aged 19. History of mental change, seclusiveness, loss of working ability, stubborn, aggressive behaviour and auditory hallucinations becoming more severe. His father is a chronic schizophrenic of this hospital. Biopsy showed severe atrophy of testis with characteristic features. Treatment with 400 units gonadotrophin *b.d.* was followed by marked change in his mental state after about the tenth injection. He became brighter, began to work, said he felt "more himself" and active. He left hospital after receiving 34 days' treatment and a fortnight later joined the Merchant Navy. He remained at sea, apparently well, for nearly twelve months. At the end of this time there was a relapse, and he was admitted to hospital with a similar mental picture as before, but in a more severe form. His habits were dirty and he masturbated excessively. Biopsy showed typical atrophy. He was treated with gonadotrophin 1,000 units daily for 40 days. Early in treatment there was mental improvement. He stated that his mind felt different, that sexual thoughts had disappeared and he ceased to masturbate. He was discharged from hospital free from symptoms and has remained well for more than 12 months.

R. P—, hebephrenia, aged 19. There was a history of mental change for about a year. When admitted he was very difficult to manage, showed typical schizophrenic thinking, received "messages by wireless," was very restless, his habits were very degraded and he masturbated excessively. Testis biopsy showed moderately severe atrophy. He was treated with gonadotrophin 1,000 units daily for 48 days. After the first week he was much more settled; said that he felt quite different and no longer had a desire to masturbate. His habits were clean. All

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symptoms rapidly disappeared. He was later discharged from hospital and has remained well for the succeeding 18 months.

Change.

S. J—, catatonic schizophrenia, aged 19. There was rapid mental change. Testis biopsy showed moderately severe damage. He was treated as an out-patient with gonadotrophin 400 units *b.d.* for 48 days. There was considerable improvement in his mental condition, and he was able to remain at work. Twelve months later he had a relapse and was admitted to hospital. There was no further improvement.

D. H—, hebephrenia, aged 20. History of mental change, auditory hallucinations and altered thought processes for 18 months; no degraded or deteriorated behaviour. Testis biopsy showed severe atrophy. He was treated with gonadotrophin 1,000 units daily for 48 days. Immediately he became brighter, more active, conversed rationally, but relapsed. There was no further maintained improvement.

C. F—, chronic hebephrenia, aged 32. Marked mental change, stationary for ten years. Testis biopsy showed severe atrophy. He had been completely impotent for years. He was treated with gonadotrophin, 1,000 units daily for 48 days. During the first ten days he reported he felt different, had sexual dreams at night and later frequent emissions. He stated that there had been none for years previously. There was no further change, and emissions did not continue after treatment was stopped.

C. A—, hebephrenia, aged 21. Mental change had existed for four years. Very dirty, surly and unco-operative. Testis biopsy showed severe atrophy. He was treated with 1,000 units gonadotrophin daily for 48 days. He became somewhat brighter and more active. This condition was maintained after cessation of treatment, and there was clearly some slight permanent improvement.

R. F—, hebephrenia, aged 19. Symptoms of three years' duration. Testis biopsy showed severe atrophy. He was treated with gonadotrophin, 800 units daily for 20 days. Formerly very slow, unco-operative and dirty in habits and inclined to masturbate. During treatment he became somewhat brighter. There was a marked increase in the tendency to masturbate.

S. P—, paranoid schizophrenia, aged 28. Biopsy showed very slight atrophy. He was treated with 1,000 units gonadotrophin daily for 48 days. He complained of increased sexual content of his already sexual thoughts and dreams.

No Change.

H. H—, chronic catatonia, aged 32. Testis biopsy showed moderate atrophy. Treated with gonadotrophin, 800 units daily for 20 days. No change.

H. B—, chronic catatonia, aged 27. Testis biopsy showed severe atrophy. Treated with gonadotrophin, 800 units daily for 20 days. No change.

A. K—, chronic simple schizophrenia, aged 38. Testis biopsy showed moderate atrophy. Treated with gonadotrophin 1,000 units daily for 48 days. No change.

D. T—, chronic catatonia, aged 26. Testis biopsy showed severe atrophy. Treated with gonadotrophin, 1,000 units daily for 48 days. No change.

P. M—, simple schizophrenia of six years' duration, aged 24. Testis biopsy showed moderate atrophy. Treated with gonadotrophin, 2,000 units daily for 48 days. No change.

G. V—, chronic schizophrenia with dementia, aged 42. Testis biopsy showed very severe atrophy. Treated with gonadotrophin 1,000 units daily for 48 days. No change.

Worse.

P. F—, simple schizophrenia of two years' duration, aged 20. Biopsy showed a fair testis. Treated with gonadotrophin, 1,000 units daily for 48 days. He became more difficult to manage, resistive, masturbated frequently, much more unco-operative. Condition greatly improved after the cessation of treatment.

E. D—, hebephrenia, aged 18. Symptoms of two years' duration. Testis biopsy showed severe atrophy. Treated with gonadotrophin, 800 units daily for 20 days. After the fourth injection he became very difficult to manage, would not dress or undress himself, masturbated almost continuously and shamelessly in the open. At times refused food and became very silent.

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E. H—, hebephrenia, aged 23. Testis biopsy showed severe atrophy. Treated with gonadotrophin, 1,000 units daily for 24 days. Little change until about the 14th injection, then he became very confused, would not speak, refused food. Subsequently seemed to deteriorate. Treatment was cut short. Later his condition cleared up, and by six months later he was much brighter, more co-operative and physically in better condition than prior to treatment.

T. W—, hebephrenia of 18 months' duration, aged 18. Troublesome, dirty, degraded behaviour, masturbated. Testis biopsy showed severe atrophy. Treated with gonadotrophin, 1,000 units daily for 48 days. Early in treatment he became much more active, restless, with great increase in masturbation. Treatment was suspended for a week. Condition cleared. Treatment was recommenced. He became confused once more with marked increase in dirty behaviour. At the end of treatment his mental condition returned to what it had been before.

Summarizing these results: Of 18 male cases two made a symptom-free remission and have been called recovered. One of these relapsed after twelve months, was again treated and made a further remission. Some definite mental change with more bodily activity occurred in six. Change for the worse with great increase in sexual behaviour was noted in four and no mental change at all in six.

Physical Effects.

There were no striking changes in gonads, secondary sexual characteristics or growth of hair. However, in most patients the testes, which previously had felt soft, were firmer after treatment, and the tubular tissue less friable in accordance with the histological picture to be described later. Several subjects had the appearance of improved health, reflected by an increase in weight. As the table shows, two patients, who were discharged, gained respectively 4 and 16 lb.; some others gained up to 6 lb. It may be that the increase in weight was due to improved mental condition with altered outlook and better appetite rather than to a physiological mechanism, but it is noteworthy that there was a substantial loss where the mental condition was worse after treatment.

Changes in the Histological Picture.

Change was observed in the histological picture of the testis in the majority of specimens. Although the exact nature and extent of the alterations are difficult to assess, the general characteristics were fairly constant. After treatment, the average size of the tubules in cross section, previously small, was larger and the inter-tubular spaces correspondingly reduced. Inter-tubular oedema was seldom evident. The thickened basement membrane, often hyalinized, was less obvious and the hyaline change nowhere as prominent as in untreated specimens. There was a definite impression that the basement membrane tended to improve. Most striking was the appearance of activity in the seminiferous epithelium. Tubules were well filled with cells in active division. The cellular architecture was much more clearly defined, and the cells had for the most part lost their degenerate appearance and stained well. There was great activity of Sertoli cells, and their processes were thickened and proliferated in a form that we have not observed before. Although some completely destroyed tubules were still to be seen, we noticed division in spermatogonia and spermatocytes even where there was severe atrophy with only a few cells surviving. It was perhaps disappointing not to observe many spermatids or spermatozoa, and we could not say with confidence that complete maturation had been effected anywhere. There was much less evidence of alteration and increased activity in seminiferous epithelium where the original picture had approached normal, as if the hormone was little effective if spermatogenesis was proceeding spontaneously. We cannot correlate the degree of endocrine response with that of mental change. Macroscopically the tissue usually appeared more normal. At biopsy good specimens were obtained; it was not so friable and the histological sections were easily cut. This is explained by the increased size of the tubules and the pressure within them from dividing cells.

Females.

D. V. B—, hebephrenia, aged 20, single. There was a history of mental change for more than 18 months. Symptoms were marked. She expressed phantastic and

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changing delusions, experienced auditory hallucinations, was dirty and degraded in her habits. She could not be employed. Convulsive therapy had produced no remissions and her condition was, if anything, deteriorating. She had not menstruated for more than 12 months. She was treated with gonadotrophin 400 units *b.d.* for 21 days. Ten days later menses commenced, lasted four days and remained regular thereafter. A few days before the first period she became extremely restless; repeatedly said that "God was inside her." After the period this idea disappeared. During the next month her mental condition showed steady improvement. There was no tendency to relapse, and she was later discharged from hospital as recovered and has remained well for at least two years.

I. W. H—, catatonic schizophrenia, aged 34, married, six children. There had been a previous attack of eight months' duration at 27. She had many phantastic and changing delusions, experienced auditory hallucinations, and there was intermittent wild excitement and violent behaviour. At times there were cataleptic episodes. Shock treatment had been ineffective. Symptoms dated from a confinement two years before, since which there had been amenorrhoea. She was treated with gonadotrophin 400 units *b.d.* for 21 days. Five weeks later menses commenced and have been normal since. The first period was preceded by a phase of wild excitement, when she expressed the idea that she had some "great power inside her." This particular delusion disappeared after the period. There has been no improvement in her mental condition, and incidentally leucotomy was later without effect.

D. C—, catatonic schizophrenia, aged 25, single. She had been treated at another institution for ten years. She was mute, dirty, resistive and totally unemployable. It was stated that there had been no menses and little alteration in the mental picture for a number of years. Convulsive therapy produced no effect. She was treated with gonadotrophin 400 units *b.d.* for 21 days. After the fourteenth dose she became bright, conversed in a simple way, did a little work in the ward, would dress and wash herself, help with sweeping and even attempt needlework. Menstruation commenced after ten days and has been normal since. There has thus been no indication for further treatment. At the time of the first period she became very restless, was difficult to manage, attacked other patients and smashed windows. Subsequently she became mute again and refused to work. She has remained for the past two years much more active, and it is to be regretted more violent and troublesome than before.

O. S—, catatonic schizophrenia, aged 25, single. There had been mental change for more than three years. When admitted she was mute, resistive, at times refused food, exhibited marked catalepsy. Later she spoke a little and could be induced to dress and eat. There was no change with shock treatment. Amenorrhoea had existed for about two years. Treatment with gonadotrophin, 400 units *b.d.* for 21 days, twice failed to produce a menstrual period and there was no change in the mental condition.

Summarizing the results of treatment in four female cases of chronic schizophrenia with amenorrhoea, one was discharged from hospital, and two were rendered at least temporarily more active and excited. Menses were restored in these three cases, the fourth failed to respond.

Discussion.

This is the first attempt, to our knowledge, to apply specific hormone therapy in schizophrenia in accordance with physiological requirements. In the male cases referred to a diagnosis of atrophy of seminiferous tubules of the testis was established by examination of histological material obtained by biopsy. In these cases treatment aimed at improving the function of the testis as a generative organ; for this reason pure follicle-stimulating gonadotrophic hormone from pregnant mare's serum was used. We have, therefore, endeavoured to treat one type of defect only, disregarding other possible deficiencies. It would have been too optimistic to expect that gonadotrophic hormone alone might be a cure for any form of schizophrenia, but we were anxious to treat the physical defect in the testis, and in so doing to ascertain whether improvement in testis function might produce mental alteration.

Our results show that, excluding two that recovered, there was mental change in more than half of the cases treated, all of whom were chronic with a hopeless

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prognosis. The majority had failed to respond to convulsive therapy. The mental changes noted were increased thought processes and brighter behaviour, but not necessarily much improvement in total personality. In five patients the treatment produced a rather unpleasant mental picture, with confusion and marked tendency to autoerotism and degraded behaviour. It may be said that the psychic change was in the sphere of the libido and sexual life. One patient described how sexual dreams and nocturnal emissions, from which he had been free for years, reappeared, and that, excessively. Of the two patients who apparently recovered, one relapsed after a remission of a year, was treated, made a quick response and was discharged once more. The duration of the second remission has been at least 12 months.

Four females suffering from chronic schizophrenia were also treated because of persistent amenorrhoea, after therapeutic attempts had been ineffective. Menses were re-established in three, one of whom recovered and was discharged. As in many of the males, the production of physiological change caused mental activation. It was interesting that two expressed their change in the same form, that there was some mysterious "Power" or "God" inside them. A chronic catatonic mute, inactive for years, spoke and worked for a while, but the improvement was not entirely maintained.

We feel justified in attributing the mental alteration of these male and female patients to the physiological results of the endocrine treatment. It seems likely that by improving testis and ovarian function or by interfering with the balance of hormone production, thereby tending to regulate anterior pituitary activity, the internal environment might be altered so as to influence the mental state. How psychologically beneficial such an alteration might be would depend upon many factors, such as the innate constitution of the individual, his capacity for psychological readjustment. It is far from sure that treatment of other glands apart from the gonads is not called for. Post-mortem investigations have usually pointed to hypoplasia of various endocrines in schizophrenia. The possibility, which appears to us unlikely, that primary testis defect is the principal causative factor in schizophrenia is not supported by our work. It is very improbable that the results we have seen are due to a purely pharmacological effect of gonadotrophin, for it is not known to possess such property, and we have not observed the same changes in every individual in spite of large doses.

We could find no definite indication for testosterone therapy, although it has had a considerable vogue in the treatment of schizophrenia. There were no gross signs of lack of internal secretion, and as far as could be judged in most cases the interstitial elements in the testis were adequate. However, it must be pointed out that the procedure of biopsy alone might be a mild therapeutic measure, for it is known to cause a regenerative response in the testis. Steinach (1927) has claimed remarkable testis regeneration with physical improvement in pre-senile men after "albugeineanatomy," in which an extensive biopsy is performed on each testis.

Lebedinsky (1930) obtained similar results by needling the testis. These procedures have been well reviewed by Romeis (1933). Kraus (1928) has demonstrated an increase in interstitial cells in animals after resection of a portion of the testis. A testis biopsy, as performed by us, is too slight to induce much compensatory regeneration, but there is evidence that it may do so, for we have found increased output of 17-keto-steroids in a number of cases (Hemphill *et al.*, 1942).

It appears fairly certain that serum gonadotrophin can improve the atrophied tubules of schizophrenia. In most cases where we have done a biopsy before and after treatment the tubular tissue at biopsy, formerly friable, was later firm. Microscopically, the size of the tubules was larger, the interstitial spaces between them correspondingly smaller and the architecture and staining characteristics of the epithelium much more clearly defined. Cell division was very active, and in many tubules there was very active proliferation of the Sertoli network. The appearance was that of an intense stimulation in what had previously been inactive, degenerating tissue. Thickened and hyalinized basement membranes so prominent before were not so much in evidence. Complete spermatogenesis was not achieved. We have not seen many mature spermatozoa, but what other tendencies are at work or other conditions necessary for full maturation is of course quite unknown. Least change, mental or histological, was seen in those patients where the histological picture had previously most approximated to normal. It would appear then that the more normal testis is rather insensitive to follicle-stimulating hormone, or that there

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are compensatory reactions in the gonadotrophic control to meet the unnecessary hormonic stimulation.

Sperm counts could not be considered in mental patients, so we did not know with certainty whether in any case there was an increased output of mature sperms, but it is probable that there was, for one patient complained of nocturnal emissions, which had been absent for years previously, and in others there was a frank increase in masturbation. Charny (1944), in treating non-mental cases of infertility, has described an improvement in the histological picture, similar to what we have seen, in a significant proportion, but an increased sperm count in disappointingly few. With the preparation we used there appears to be no objection to prolonged treatment, for in ten patients, who had received 1,000 units daily for 48 days, antihormones were present in the blood of two; one of these, H. B—, had been treated previously with an earlier batch.

In assessing the results of treatment it must be borne in mind that the cases were for the most part long standing, with a very poor prognosis. We can claim that two males and one female have been discharged from hospital and that, of others, there has been some alteration in mental life, although other attempts at treatment had failed to produce any. There appears to us to be a definite justification for hormone treatment in schizophrenia, but it is necessary to establish therapeutic indications based on proper diagnostic tests. Atrophy of the testis points to inadequate anterior pituitary control, and though the means do not exist for investigating defects in other glands, as we have done the testis, they are to be expected, and post-mortem studies support the contention that in many cases there is a pluri-glandular hypofunction. It would be well worth while to treat a series of patients early in the development of the psychosis, in whom testis atrophy was found, with a combination of other anterior pituitary as well as gonadotrophic hormones, but there are practical difficulties, such as great expense and shortage of supply.

Summary.

1. Eighteen male cases of schizophrenia with histological evidence of atrophy of the testis were treated with gonadotrophic hormone of pregnant mare's serum.

2. Two recovered. There was some mental change in six; four were worse during treatment, but settled later. There was no change in the remainder.

3. There was considerable regeneration of the testis of several, with increased cell division and larger size of tubules. Final stages of spermatogenesis were not promoted. There was no evidence of an increase of mature sperm production.

4. Biopsy as a diagnostic measure has been discussed, and its possible regenerative effect on atrophic testis has been noted.

5. Of four chronic schizophrenic females with amenorrhoea treated with serum gonadotrophin, one recovered. There was some mental change in two. Restoration of menses was effected in these three.

6. Indications for sex hormone treatment in schizophrenia have been discussed.

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A FACTORIAL STUDY OF SOME MORPHOLOGICAL AND PSYCHOLOGICAL ASPECTS OF HUMAN CONSTITUTION.

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1. *Introduction.*—Since Hippocrates and his Roman followers described the *habitus apoplecticus* and the *habitus phthisicus*, linking these antithetical physical types with certain temperamental peculiarities and with susceptibility to specific diseases, much research has been carried out in an attempt (1) to prove the existence of physical types and to discover their nature, and (2) to investigate the relation of these types to temperamental traits. This work has done much to clarify the issues at stake.

Four main schools have contributed to the development of a consistent body of knowledge in this field of the relation of body-build and temperament, each making its specific contribution. Rostan (24) and the French school generally may be credited with the elaboration of the tripartite scheme of body-type (digestive, muscular, and respiratory-cerebral) which has recently been brought back to favour by Kretschmer (18) and Sheldon (25).

The Italian school, founded by Giovanni, introduced the idea of measurement and statistical analysis into the field, and Viola (29) elaborated his morphological index on this basis, dividing the population into microsplanchnic, normosplanchnic and megalosplanchnic types. The German school, beginning with Carus (4) and Beneke (1), added the important theory that body-build is correlated with mental illness.

The Anglo-American school, following the lead of Galton and Pearson, used the concept of correlation to determine more strictly the actual relation between isolated body measurements and single psychological traits (Patterson (22)); they also criticized extensively the very basis of "type" theory, substituting a system of normally-distributed "traits" instead.

In order to determine the nature of the main "traits" in the cognitive, conative and affective fields, the statistical procedure of Factorial Analysis (Burt (2), Thomson (27); Thurstone (28)) has been elaborated, which enables the investigator to isolate the fundamental vectors underlying his measurements in these respective fields. Recently, factorial studies have been made in the field of body measurement (Cohen (5, 6 and 7), Mullen (20), Hammond (15)), and the results suggested to us that this method might be useful in (*a*) determining the main types of body-build, (*b*) making it possible to derive an index of body-type free from the arbitrariness with which many of the indices in the past have been constructed, and (*c*) deriving correlations, not between isolated measurements of morphological and psychological variables, but between morphological and psychological syndromes or trait-constellations.

Although we found previous analyses of great interest and of suggestive value, we considered it necessary to carry out a special analysis of our own, because previous work had certain drawbacks which made the conclusions arrived at inapplicable in detail to our own sample. The number of persons measured had sometimes been rather small; the number of measurements taken had not always been sufficient; and the samples studied (students, psychotics, adolescent boys and girls) bore little resemblance to the material with which we had to deal. The fact that in spite of such wide differences in sampling and procedure our results are in close essential agreement with those of other students encourages us to believe that the factors isolated are truly fundamental in the determination of body-build.

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If it be conceded that the factorial method enables us to establish the main phenotypical (if not the main genotypical) determinants of body-type and body-build, then we are in a position to derive from our data an index of body-type which will have a rather more objective basis than some of those suggested in the past.

The method adopted, which has not to our knowledge been used before, consists in (1) establishing the " types " actually existing in an unselected population by means of a factorial analysis, and (2) measuring these " types " by means of an index containing the most diagnostic measurements as items and their factor saturations (or derivatives of these saturations) as weights. As a last step, it will then be possible (3) to see whether body-types are only the extremes of a normal distribution, or whether there really exist separate " types " giving rise to a bimodal or a multimodal distribution of indices.

Having thus established a valid measure of body-type, we can make an attempt to correlate body-type with various psychological factors. In particular, it will be of interest to see how body-type is related to the main psychological types found previously in a factorial study of 39 personality traits in 700 neurotic soldiers (Eysenck (10)), how it is related to the complex of traits commonly called "schizoid," and how it is related to what might be designated " level of abnormality," as defined by seriousness of present disease, and by hereditary and home factors.

2. *Experimental material.*—Altogether, 389 successive admissions to Mill Hill Emergency Hospital were measured, as well as a sample of 100 non-neurotic soldiers of similar age distribution and military status. Our main interest was in the neurotic group, for whom intelligence test results and temperament and personality ratings by the psychiatrist in charge were available, in addition to the measurements.

The technique used in taking the anthropomorphic measurements was that described by Hrdlicka (16), some additional measurements being taken according to the methods described by Martin (19) and Wilder (30). All the measurements were taken by one of us (W.L.R.), always at the same time of the day, thus eliminating two possible sources of error in measurement. In Table I, below, are set out the actual measurements taken, as well as the means and S.D.'s of the measures for the normal group and for a sample of 200 neurotics, representing successive admissions.

In addition to the measurements, somatoscopic gradings were carried out on Kretschmer's leptosomatic-pyknic scale for each of the 100 normal soldiers, one of us (W.L.R.) dividing the subjects into seven groups as defined below:

TABLE I.

	100 normal soldiers.		200 successive admissions to neurosis centre.	
	Mean.	S.D.	Mean.	S.D.
Age	29·27	6·06	28·8	5·89
Stature	171·01	5·32	170·9	6·77
Suprasternal height	139·47	4·67	139·4	5·78
Symphysis height	86·39	4·55	86·5	4·81
Trunk length	53·41	2·05	52·9	2·58
Breadth of skull	15·28	0·52	14·9	0·58
Length of skull	19·60	0·65	19·2	0·66
Biacromial diameter	39·61	2·10	38·8	1·68
Transverse chest diameter	28·77	2·12	27·9	1·85
Sagittal chest diameter	20·60	1·63	20·4	1·58
Bicristal diameter	29·08	1·59	26·7	1·61
Sternal length	21·89	2·23	21·2	1·78
Arm length to radial styloid	55·77	2·35	55·7	2·78
Arm length to tip of medius	76·45	3·23	75·3	3·57
Chest circumference at inspiration	95·79	4·87	92·2	3·57
Chest circumference at expiration	87·96	5·30	86·5	4·50
Hip circumference	79·93	6·64	80·2	5·27
Weight	65·00	6·88	64·6	7·22

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1. Extreme leptosome
2. Average leptosome
3. Leptosome intermediate
4. Average intermediate
5. Pyknic intermediate
6. Average pyknic
7. Extreme pyknic

Leptosome = 23 per cent.
Intermediate = 53 per cent.
Pyknic = 24 per cent.

This grading was carried out before the factorial analysis described in the next section was undertaken, and before our Index of Body-Type was developed quite independently. It is necessary to stress the fact that the intuitive rating, based largely on reading and experience with judgments of body-type, and the perfectly objective, mathematico-inductive method used in developing our Index, were carried out without reference to each other, because otherwise the extremely high correlation between the results of the two methods ($r = +0{\cdot}962$) might be thought to be due to a lack of independence of the two methods.

TABLE I.

	1.	2.	3.	4.	5.	6.	7.	8.
1. Age	..	−·071	−·050	−·069	+·048	+·029	−·150	+·[illegible]
2. Stature	..	..	+·915	+·875	+·089	+·179	+·454	+·[illegible]
3. Suprasternal height	..	..	..	+·851	+·109	+·188	+·488	+·[illegible]
4. Symphysis height	..	..	..	..	+·106	+·178	+·460	+·[illegible]
5. Skull breadth	..	..	..	..	..	+·149	+·222	+·[illegible]
6. Skull length	..	..	..	..	..	..	+·146	+·[illegible]
7. Biacromial diameter	..	..	..	..	..	..	..	+·[illegible]
8. Transverse chest diameter	..	..	..	..	..	..	..	..
9. Sagittal chest diameter	..	..	..	..	..	..	..	..
10. Bicristal diameter	..	..	..	..	..	..	..	..
11. Trunk length	..	..	..	..	..	..	..	..
12. Sternal length	..	..	..	..	..	..	..	..
13. Arm length to radial styloid	..	..	..	..	..	..	..	..
14. Arm length to tip of medius	..	..	..	..	..	..	..	..
15. Chest circumference at inspiration	..	..	..	..	..	..	..	..
16. Chest circumference at expiration	..	..	..	..	..	..	..	..
17. Hip circumference	..	..	..	..	..	..	..	..
18. Weight	..	..	..	..	..	..	..	..

3. *Factorial analysis.*—Intercorrelations of the 18 variables (age and 17 body measurements) were calculated for 200 neurotics, representing successive admissions to the hospital, and are given in full in Table II. As will be seen, all the coefficients are positive excepting some of those with age. In Table III are given the results of a factorial analysis of Table II, carried out by means of Burt's Summation Method (2). Two significant factors were extracted. The first factor, which has positive saturations throughout, contributes 34 per cent. to the variance, while the second factor, which is bipolar, contributes 12 per cent. to the variance. The communality of each item is also given ($= h^2$) ; it will be seen that the communality is ·46, while the uniqueness ($= u^2$) is ·54.

Table III gives, in addition to the saturations and the communalities, the correlations of each item with the Morphological Index, the Pignet Index, the Stromgren Index, the Brugsch Index,* and an intelligence test score. (The test used was the Progressive Matrices Test (Raven (23)), which has been studied extensively in connection with neurotic patients (Eysenck (11, 12)). It will be seen that, roughly speaking, the correlations of the indices with the various items correspond in size and sign with the second factor saturations ; the Brugsch index, which measures the same factor as the other indices in reverse, as it were, has of course opposite sign in most cases to the saturations and the other indices.

* These indices are defined in the Appendix, where references will also be found.

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The interpretation of these two factors is perhaps too obvious to require formal statement. The first factor measures general bodily growth in all directions; the second factor measures specific growth in length as opposed to growth in breadth. The first factor is a factor of *body-size*, while the second factor is one of *body-type*, dividing the *homo crassus* from the *homo macer*. That this type-factor is essentially identical with the classical body-types is shown by a comparison of the saturations in Table III with the correlations of the various measurements with the indices given there.

This interpretation is in good agreement with the interpretation put upon the results of their respective analyses by Cohen, Hammond, and Mullen, whose work, carried out on human material differing widely from our own, gives in general results very similar to those reported above. Three studies by Cohen on 64 males and 62 female psychotics and 50 university students (5, 6, 7), a study by Hammond on 100 Irish males (15), and a study by Mullen on 305 girls, 15 years of age (20), all resulted in finding two factors substantially identical with those isolated in the present study. Below are given the percentage contributions of the two factors in

9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
+·177	−·103	+·004	+·162	−·085	−·027	+·087	+·129	+·103	−·008
+·296	+·494	+·457	+·252	+·727	+·710	+·252	+·184	+·292	+·471
+·351	+·503	+·504	+·331	+·797	+·780	+·324	+·255	+·378	+·553
+·301	+·484	+·163	+·194	+·803	+·751	+·230	+·199	+·323	+·442
+·148	+·279	+·076	+·103	+·061	+·087	+·309	+·298	+·331	+·309
+0·97	+·113	+·136	−·046	+·195	+·215	+·171	+·152	+·095	+·266
+·302	+·451	+·218	+·232	+·504	+·504	+·500	+·503	+·487	+·613
−·361	+·452	+·202	+·248	+·259	+·246	+·731	+·711	+·572	+·686
..	+·403	+·225	+·296	+·381	+·329	+·616	+·594	+·562	+·601
..	..	+·305	+·401	+·504	+·488	+·466	+·492	+·743	+·634
..	..	..	+·306	+·271	+·251	+·200	+·181	+·046	+·341
..	..	..	..	+·300	+·322	+·248	+·209	+·170	+·156
..	..	..	..	..	+·266	+·077	+·140	+·139	+·101
..	..	..	..	..	..	+·085	+·116	+·144	+·113
..	..	..	..	..	..	..	+·315	+ 223	+·219
..	..	..	..	..	..	..	..	+·291	+·296
..	..	..	..	..	..	..	..	..	+·222
..	..	..	..	..	..	..	..	..	..

each of these studies to the variance, their communalities, the number of subjects used (n), and the number of measurements taken (N). Also included in this Table are the results of a factorial analysis we ventured to undertake of some correlations reported by Dearborn and Rothney (8). These authors deny the existence of morphological types, but our analysis confirms Burt's criticism of their view (3), and shows that their conclusions are not in line with their results.

The differences, both absolute and relative, between the saturations and the communalities of these various studies are probably mainly due to (1) the different selection of characteristics measured, and (2) the differences in homogeneity in the various samples measured.

In Fig. 1 is given a geometrical representation of the factor pattern. Two groups of measurements are seen to stand out as defining clearly the two aspects of the bipolar factor; on the one hand, stature, suprasternal height, symphysis height, and arm length; on the other, transverse chest diameter, hip circumference, and chest circumference. When the two best-fitting lines are drawn through these two clusters, their angle of separation (alpha) is 71′ 30″, which corresponds to a correlation of + 0·32 between the two clusters. The fact that even extreme measures of the two body types correlate together weakens the argument that we should have used some method of axis-rotation in order to reach " simple structure "

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TABLE III.

	First factor.	Second factor.	Communality.	Morphological index.	Pignet index.	Stromgren index.	Brugsch's index.	Intelligence grade.
1. Age	+·02	−·09	+·01	−·25	−·10	−·10	+·14	+·17
2. Stature	+·73	+·57	+·85	−·03	+·18	+·39	−·50	+·11
3. Suprasternal height	+·82	+·56	+·98	+·15	+·08	+·29	−·70	+·08
4. Symphysis height	+·69	+·47	+·70	+·09	+·14	+·33	−·38	+·06
5. Breadth of skull	+·31	−·27	+·17	−·24	−·31	−·18	+·16	−·06
6. Length of skull	+·25	+·00	+·06	−·11	−·02	−·03	−·07	−·04
7. Biacromial diameter	+·71	−·11	+·51	−·35	−·32	−·13	+·22	+·01
8. Transverse chest diameter	+·67	−·54	+·74	−·63	−·64	−·69	+·57	−·06
9. Sagittal chest diameter	+·65	−·23	+·47	−·66	−·54	−·61	+·43	+·06
10. Bicristal diameter	+·77	−·05	+·59	−·34	−·33	−·20	+·16	+·11
11. Trunk length	+·41	+·15	+·19	−·40	−·07	+·01	−·09	+·10
12. Sternal length	+·41	+·06	+·17	−·17	−·10	−·12	+·02	+·12
13. Arm length to radial styloid	+·58	+·46	+·55	+·00	−·02	+·02	+·00	+·06
14. Arm length to tip of medius	+·57	+·39	+·47	−·09	−·03	−·03	−·01	+·07
15. Chest circumference at inspiration	+·54	−·35	+·41	−·16	−·24	−·23	+·22	+·05
16. Chest circumference at expiration	+·54	−·41	+·46	−·26	−·28	−·35	+·33	+·10
17. Hip circumference at expiration	+·54	−·33	+·40	−·17	−·12	−·22	+·13	+·18
18. Weight	+·64	−·23	+·46	−·19	+·02	−·24	+·13	+·17

TABLE IV.

Investigator.	Factor I. %	Factor II. %	h^2. %	n.	N.
Cohen, 1	44	24	68	50	14
,, 2	46	19	65	64	14
,, 3	35	25	60	62	12
Hammond	31	9	40	100	12
Dearborn and Rothney	59	8	67	533	8
Mullen	56	19	75	305	8
Rees and Eysenck	34	12	46	200	18
Average	43	17	60	188	12

(Thurstone (28)); with figures of this kind the non-rotated factors appear more meaningful than rotated orthogonal or oblique factors (Holzinger (15*a*)).

We conclude accordingly that there are two main factors in body-build: (1) a general factor of over-all growth, bulk, or *body-size*, and (2) a factor determining *body-type*, according to whether growth has taken place mainly in *length* or in *breadth*. Whether these factors are merely *phenotypes*, of descriptive convenience only, or *genotypes*, of some more fundamental importance, cannot be decided on the basis of a factorial analysis. Such outside evidence as is available, however, suggests that our factors are connected with some fundamental physiological processes.

Hall (14), in a study of growth in 2,000 school-children, found that when the vertical dimension of the body undergoes an acceleration, the horizontal dimension undergoes a retardation in its rate of growth. More recently, Duckworth (9) quotes the work of Godin, who found that growth in length alternates with growth in breadth. Friend (13) found in growing schoolboys that the maximum increase in height occurred during spring, while that for weight occurred in autumn. Finally, the postulation of two factors of growth is consistent with the distinction drawn by Huxley (17) between *isogonic* and *heterogonic* growth in lowlier animals. These researches seem to lend strong support to the results of our statistical analysis.

4. *Index of body-type.*—The main scientific requirements of an index of body-type have been mentioned in the introduction: (1) That the types to be measured

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should be defined inductively, not arbitrarily, and (2) that the index must be derived mathematically from the correlations of the various measurements with the "type" factor isolated. To these scientific requirements we may add the practically desirable points (3) that the index should be simple, consisting of few, easily made measurements, and not embody any complex statistical method of calculation, in order that interested workers from other fields should be able to use it without difficulty; and (4) that the index should have a mean of 100 (by analogy with the I.Q.) and a coefficient of variation of at least 5, and preferably higher than that.

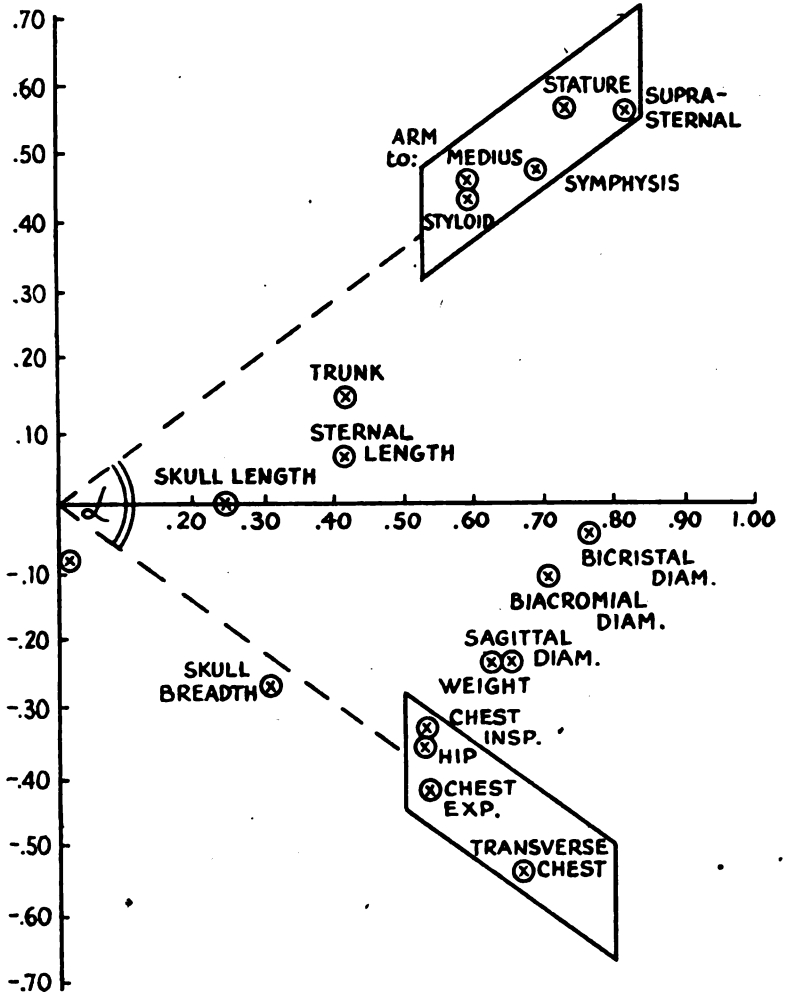

FIG. 1.

The first of these four requirements has been fulfilled by factor-analysing the observed correlations between the measurements taken, and we are left with the task of devising a simple yet accurate and discriminative index from the factor saturations as set out in Table III. The most obvious method would be that of forming a regression equation including all the measurements significantly correlated with the type-factor. This method would lead to a cumbersome formula, however, and we have preferred a simpler but probably no less accurate method.

Reference to Fig. 1 will show that we have two measurements which (1) have correlations with the first factor which are equal in size and similar in sign, and

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	34·	33·5	33	32·5	32	31·5	31	30·5	30	29·5	
185 .	91·8	92·0	93·4	94·8	96·3	97·8	99·4	101·0	102·7	104·5	10
184 .	90·1	91·5	92·9	94·3	95·8	97·3	98·9	100·5	102·2	103·9	10
183 .	89·7	91·0	92·4	93·8	95·3	96·8	98·3	100·0	101·6	103·3	10
182 .	89·2	90·5	91·9	93·3	94·7	96·2	97·8	99·4	101·1	102·8	10
181 .	88·7	90·0	91·4	92·8	94·2	95·7	97·3	98·9	100·5	102·2	10
180 .	88·2	89·5	90·9	92·3	93·7	95·2	96·7	98·3	100·0	101·6	10
179 .	87·7	89·0	90·4	91·7	93·2	94·7	96·2	97·8	99·4	101·1	10
178 .	87·2	88·5	89·8	91·2	92·7	94·1	95·6	97·2	98·8	100·5	10
177 .	86·7	88·0	89·3	90·7	92·1	93·6	95·1	96·7	98·3	100·0	10
176 .	86·2	87·5	88·8	90·2	91·6	93·1	94·6	96·1	97·7	99·4	10
175 .	85·7	87·0	88·3	89·7	91·1	92·5	94·0	95·6	97·2	98·8	10
174 .	85·2	86·5	87·8	89·2	90·6	92·0	93·5	95·0	96·6	98·3	10
173 .	84·8	86·0	87·3	88·7	90·1	91·5	93·0	94·5	96·1	97·7	9
172 .	84·3	85·5	86·8	88·2	89·5	91·0	92·4	93·9	95·5	97·1	9
171 .	83·8	85·0	86·3	87·6	89·0	90·4	91·9	93·4	95·0	96·6	9
170 .	83·3	84·5	85·8	87·1	88·5	89·9	91·3	92·8	94·4	96·0	9
169 .	82·8	84·0	85·3	86·6	88·0	89·4	90·8	92·3	93·8	95·4	9
168 .	82·3	83·5	84·8	86·1	87·5	88·8	90·3	91·8	93·3	94·9	9
167 .	81·8	83·0	84·3	85·6	86·9	88·3	89·7	91·2	92·7	94·3	9
166 .	81·3	82·5	83·8	85·1	86·4	87·8	89·2	90·7	92·2	93·7	9
165 .	80·8	82·0	83·3	84·6	85·9	87·3	88·7	90·1	91·6	93·2	9
164 .	80·3	81·5	82·8	84·1	85·4	86·7	88·1	89·6	91·1	92·6	9
163 .	79·9	81·0	82·3	83·5	84·8	86·2	87·6	89·0	90·5	92·0	9
162 .	79·4	80·5	81·8	83·0	84·3	85·7	87·0	88·5	90·0	91·5	9
161 .	78·9	80·0	81·3	82·5	83·8	85·1	86·5	87·9	89·4	90·9	9
160 .	78·4	79·6	80·8	82·0	83·3	84·6	86·0	87·4	88·8	9013	9

(2) have correlations with the second factor which are equal in size and opposite in sign. These two measurements are Stature and Transverse Chest Diameter. By dividing one by the other we can eliminate the influence of the general factor on our index, while the size of the fraction indicates the relative position of the subject measured on the body-type continuum. If in addition we multiply the Transverse Chest measurement by 6 (because Stature is on the average six times as large as Transverse Chest Diameter) and multiply the whole fraction by 100, we obtain an index which has a mean of approximately 100, a coefficient of variation of over 5, and which accordingly fulfils all our requirements. (The average Index of Body-Type for 100 normal soldiers was 100·1, with a S.D. of 5·82.)

The complete formula for our index, hereafter simply referred to as the Index of Body-Type, or I.B., is therefore:

$$\text{I.B.} = \frac{\text{Stature} \times 100}{6 \times \text{Transverse Chest Diameter}}.$$

In order to facilitate calculation of this index, we offer Table V, in which indices have been calculated for every combination of stature and transverse chest measurement within the limits indicated in the Table. In order to find the appropriate I.B., it is only necessary to enter the Table with the Stature measurement nearest the desired one, and go along the row till the column containing the appropriate "Transverse Chest" measurement is reached. The figure at the intersection of row and column is the desired I.B.*

The distribution of indices for 400 neurotic soldiers is given below, in Fig. 2. It will be seen that the distribution is approximately normal, with a marked positive skewness. ($\text{Sk} = \frac{3(\text{M}-\text{Mdn})}{6} = 1{\cdot}28$.) There is no evidence of bimodality, and thus no evidence of "types," except in so far as types are regarded as merely the extremes of a normal distribution. The mean I.B. for this sample of neurotics is 102·44, with a S.D. of 6·974. The mean of this sample does not differ significantly from that of the normal group cited above. The difference in S.D. between the two groups is significant, however, the Critical Ratio being 2·3. This indicates

* Stature is taken as the height of the vertex above the ground with the individual standing in stockinged feet. Transverse chest diameter is taken at the fourth costo-chondral junction (nipple level may be taken in males), midway between inspiration and expiration.

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28·5	28	27·5	27	26·5	26	25·5	25	24·5	24	23·5	23
108·1	110·1	112·1	114·1	116·3	118·5	120·9	123·3	125·8	128·4	131·2	134·0
107·6	109·5	111·5	113·5	115·7	117·9	120·2	122·6	125·1	127·7	130·4	133·3
107·0	108·9	110·9	112·9	115·0	117·3	119·6	122·0	124·4	127·0	129·7	132·6
106·4	108·2	110·3	112·3	114·4	116·6	118·9	121·3	123·8	126·3	129·0	131·8
105·8	107·7	109·6	111·7	113·8	116·0	118·3	120·6	123·1	125·6	128·3	131·1
105·2	107·1	109·0	111·1	113·2	115·3	117·6	120·0	122·4	125·0	127·6	130·4
104·6	106·5	108·4	110·4	112·5	114·7	116·9	119·3	121·7	124·3	126·9	129·7
104·0	105·9	107·8	109·8	111·9	114·1	116·3	118·6	121·0	123·6	126·2	128·9
103·5	105·3	107·2	109·2	111·3	113·4	115·6	118·0	120·4	122·9	125·5	128·2
102·9	104·7	106·6	108·6	110·6	112·8	115·0	117·3	119·7	122·2	124·8	127·5
102·3	104·1	106·0	108·0	110·0	112·1	114·3	116·6	119·0	121·5	124·1	126·8
101·7	103·5	105·4	107·4	109·4	111·5	113·7	116·0	118·3	120·8	123·4	126·0
101·1	102·9	104·8	106·7	108·8	110·8	113·0	115·3	117·6	120·1	122·6	125·3
100·5	102·3	104·2	106·1	108·1	110·2	112·4	114·6	117·0	119·4	121·9	124·6
100·0	101·7	103·6	105·5	107·5	109·6	111·7	114·0	116·3	118·7	121·2	123·9
99·4	101·1	103·0	104·9	106·9	108·9	111·1	113·3	115·6	118·0	120·5	123·1
98·8	100·5	102·4	104·3	106·2	108·3	110·4	112·6	114·9	117·3	119·8	122·4
98·2	100·0	101·8	103·7	105·6	107·6	109·8	112·0	114·2	116·6	119·1	121·7
97·6	99·4	101·2	103·0	105·0	107·0	109·1	111·3	113·6	115·9	118·4	121·0
97·0	98·8	100·6	102·4	104·4	106·4	108·4	110·6	112·9	115·2	117·7	120·2
96·4	98·2	100·0	101·8	103·7	105·7	107·8	110·0	112·2	114·5	117·0	119·5
95·9	97·6	99·3	101·2	103·1	105·1	107·1	109·3	111·5	113·8	116·3	118·8
95·3	97·0	98·7	100·6	102·5	104·4	106·5	108·6	110·8	113·1	115·6	118·1
94·7	96·4	98·1	100·0	101·8	103·8	105·8	108·0	110·2	112·5	114·8	117·3
94·1	95·8	97·5	99·3	101·2	103·2	105·2	107·3	109·5	111·8	114·1	116·6
93·5	95·2	96·9	98·7	100·6	102·5	104·5	106·6	108·8	111·1	113·4	115·9

that the neurotic population contains more extremes than does the normal population—a finding of particular interest in view of the fact that precisely the same relation holds true in the field of intelligence testing, where some 3,000 neurotics were found to have the same mean but a higher S.D. than a comparable normal population (Eysenck (11)).

Many investigators believe with Kretschmer that no formula or index can achieve as accurate an appraisal of such a complex entity as human body-type as can the experienced investigator in his subjective judgment or rating. While we cannot agree with this argument, and while we deprecate the subjectivity inherent in all somatoscopic ratings, we decided that it might be of some interest to see how our index, and a number of other indices, correlated with a somatoscopic rating of a sample of 100 normal soldiers.

In Table VI below are set out the various indices used, the product-moment correlations of these indices with the somatoscopic rating, the percentage of causal factors measured by the indices, and their respective indices of forecasting efficiency ($100r^2$ and 100 $(1-\sqrt{1-r^2})$ respectively), when the somatoscopic rating is taken as the validating criterion. It will be seen that the I.B. has a correlation of ·96 with the criterion, an index of forecasting efficiency of 73, and measures 92 per cent. of the causal factors, while the next-best index, the Stromgren, has a correlation of ·81, an index of forecasting efficiency of 42, and measures 66 per cent. of the causal factors. All the other indices show even less agreement with the somatoscopic ratings than does the Stromgren. On the basis of these correlations, then, we may conclude that our index reduplicates the intuitive judgment of the anthropometric worker more faithfully than any of the other indices examined.

While we have failed to find any evidence for definitely segregated types of the kind envisaged by Kretschmer, it will be helpful to divide our population into three "types" on the basis of the curve presented in Fig. 2. We propose to call those individuals whose I.B. is more than one S.D. above the mean "leptomorphs," those whose I.B. is within one S.D. either way of the mean "mesomorphs," and those whose I.B. is more than one S.D. below the mean "eurymorphs." We do not mean to imply any lack of continuity between these three groups, and have only separated them out in this fashion for the sake of convenience, drawing quite arbitrary dividing lines at the points which suited our purpose. To emphasize the essential difference between our approach and that of Kretschmer, we have

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preferred to use some neutral terms rather than adopt terms reminiscent of his system, or indeed of any other system. And while our "types" are of course similar in many ways to those of Kretschmer and many other workers (*cf.* Tables III and VI), our work with psychotics, which will be reported in another paper, pointed to essential differences between our types and those of others, differences which it would be undesirable to gloss over by adopting a terminology implying relations not in actual fact observed by us.

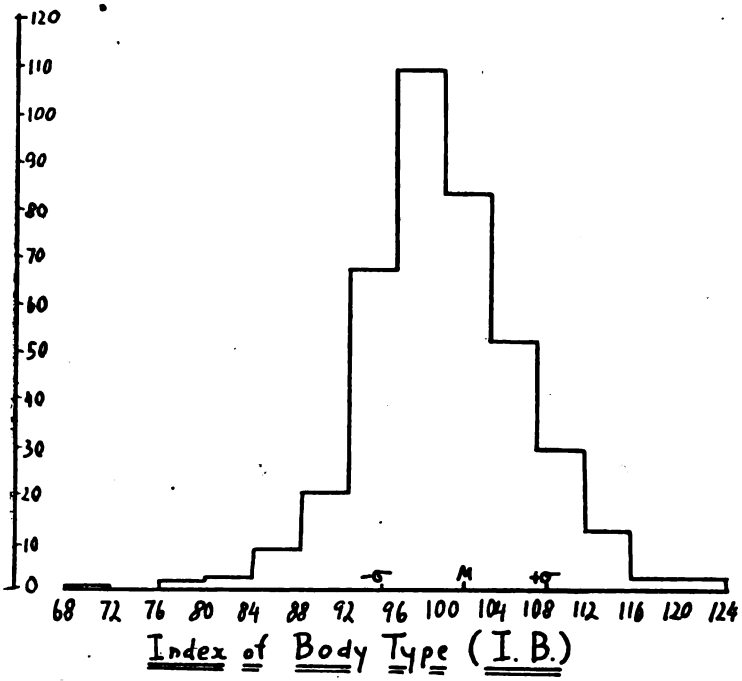

FIG. 2.

TABLE VI.

Index.	Correlation.	Percentage of causal factors measured.	Index of forecasting efficiency.
1. Rees-Eysenck, I.B.	·96	92·5	73
2. Bornhardt, A.	·50	25·4	14
3. Rohrer	·26	6·8	3
4. Brugsch	·70	49·6	29
5. v. Rohden	·74	54·7	33
6. Lucas and Pryor	·30	9·0	5
7. Pignet-Ver Vaeck	·76	57·7	35
8. Martin	·08	0·6	0
9. Stromgren	·81	66·2	42
10. Pignet	·79	62·4	39
11. Morphological index	·78	60·8	37
12. $\frac{\text{Stature}}{\text{Sagittal chest diameter}}$	·67	44·9	26

(A full description of these indices, with references, is given in the Appendix.)

5. *Psychological factors.*—In order to study the correlations of body-type with psychological factors, we divided our experimental population of 389 neurotic soldiers into three groups, as described in the previous section: 60 leptomorphs, 241 mesomorphs, and 88 eurymorphs. These 389 patients had been rated by the psychiatrist in charge on some 200 points, relating to personality, temperament, syndrome, diagnosis, schooling, upbringing, work history, etc., and we tried to

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determine those points on which significant or suggestive differences appeared between the groups. The percentage of times each item was noted in the three groups was calculated, and differences tested by means of the Critical Ratio, i.e., the ratio of the difference to its standard error.*

The findings are set out in Table VII. Items marked with one cross (+) are suggestive, with a C.R. somewhat less than 2; items marked with two crosses (++) are significant, with a C.R. of between 2 and 3; items marked with three crosses (+++) are very significant, with a C.R. of over 3. Significance also derives from the fact that differences tend to be consistent; this fact, however, has not been taken into account in the calculation of significance.

The items in the Table are grouped into five sets. The items in the first set were largely taken from the results of a factorial study, reported elsewhere, carried out on 39 personality traits and 700 neurotic soldiers (Eysenck (10)). In this study, a strong bipolar factor emerged which appeared to differentiate the "hysterical" traits from the affective or dysthymic, i.e., from the anxiety, depressed and obsessional traits. High intelligence correlated positively with dysthymia, and much unemployment positively with "hysteria." It will be seen from the Table that leptomorphs tend to suffer from the various "affective" symptoms, while eurymorphs tend to suffer from the various "hysterical" symptoms. Mesomorphs are intermediate between the other two groups for frequency of the two kinds of symptoms. The finding that intelligence is positively correlated with leptomorphic body-build confirms similar findings by Naccarati (21), Sheldon (26), and others, as well as Viola's belief that the microsplanchnic is a hyperevolute, and more intelligent than the macrosplanchnic.

The items in the second set all have reference to what may be called "seriousness of abnormality," as defined by hereditary and home factors, as well as by the psychiatrist's estimate of the patient's present personality. It will be seen that there are hardly any differences between leptomorphs and mesomorphs on this score, while eurymorphs show a much higher percentage of individuals with evidence of "serious" abnormality. The selection of items as well as the interpretation is to some extent arbitrary, of course, but the findings are fairly consistent.

In the third set we have items which we considered to be characteristic of the so-called "schizoid personality"; again there is a considerable measure of arbitrariness in the allocation of an item to this ill-defined group. Again, however, the findings are in agreement with expectation; leptomorphs tend to be more schizoid than eurymorphs, and in several instances than mesomorphs.

In set four we have set down a number of items of general interest which differentiate between the morphological groups, but which cannot easily be fitted into one of the previous sets. In the fifth set we have put items on which mesomorphs on the one hand differentiated from leptomorphs and eurymorphs on the other. The meaning and interpretation of these items, many of which show significant and very significant differences, is not very clear.

Taking these results all in all, and basing our interpretation not on isolated results so much as on the congruence of several different pointers, we may conclude that in the sample examined the eurymorphs tend towards hysteria, show a more serious "level of abnormality" and contain fewer schizoid personalities than do the leptomorphs, who tend towards the affective disorders and contain a comparatively high percentage of schizoid personalities.† Various other differences reached the level of statistical significance, but do not fall into any definite pattern. Mesomorphs tend to be intermediate between eurymorphs and leptomorphs with regard to the majority of the traits examined, just as they are intermediate with regard to body-build. On the whole, these data are presented not as final proof, but as evidence, both confirmatory and suggestive, of complex relations between body-type and personality.

6. *Discussion.*—The results reported in this paper, together with results from previous work from this laboratory, seem to indicate strongly the existence of two temperamental "types," characterized by specific personality traits (10), specific

* Differences were tested between *leptomorph* and *eurymorph* groups, except in Set V, where *mesomorphs* on the one hand were contrasted with the two extreme groups on the other.

† These findings would appear to corroborate Jung's dictum regarding the "essential relationship" between psychasthenia and schizophrenia; his psychasthenia corresponds roughly to our "affective disorder" or "dysthymia."

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TABLE VII.

Personality trait rating.	Leptomorph.	Mesomorph.	Eurymorph.	Standard of significance.
Set One.	%	%	%	
Consistently depressed.	38	34	27	+
Anxious	67	63	54	+
Obsessional	25	16	10	++
Somatic anxiety (autonomic imbalance)	58	55	43	+
Reactive depression	27	20	12	++
Intelligence above average	30	23	18	+
Much unemployment	12	18	27	++
Very hysterical	2	4	14	++
Set Two.				
Psychosis in near relatives	5	9	28	+++
Pronounced neurosis in same	42	40	55	+
Unsatisfactory home	22	27	33	+
Normal before present illness	89	87	79	+
Unstable, ill-adjusted	42	40	50	+
Boarded out of the army	52	51	62	+
Set Three.				
Single	35	24	23	+
Teetotal or abstemious	60	59	43	++
Narrow hobbies and interests	75	76	24	+++
Weak, dependent	60	38	41	++
Inert, without initiative	33	33	26	+
Muscular tone and posture good	13	32	40	+++
Age below 25	43	32	25	++
Set Four.				
Rebellious, aggressive	8	19	16	+
Elementary education only	80	86	93	++
Past health good	48	54	59	+
Loss of weight	18	12	5	++
Psychopathic personality	12	8	3	++
Set Five.				
Unskilled	48	36	41	+
Sex inhibited	8	13	7	++
Severe head injury part of present illness	8	12	5	++
Other physical diseases, relevant to present illness	2	7	1	++
Severe headaches	10	15	9	++
Fatigue, effort intolerance	65	55	62	+
Fainting fits	27	10	16	+++

neurotic disorders (10), specific body-build, specific autonomic reactivity (12*a*), and specific response to psychological tests.* These types are conceived, not as entirely separate categories into which human beings can be classified dichotomously, but as the extreme ends of a normal trait-continuum, stretching from the typical representative of the "hysterical" or extraverted type on the one side, to the typical representative of the "affective" or introverted type on the other.

This type-continuum was established entirely with reference to neurotic patients, and it may well be objected that no typology thus derived can be considered adequate for the normal, non-neurotic population. In a previous paper, in which an attempt was made to establish the existence and nature of the two main neurotic syndromes, a number of references was given to work with normal subjects which showed that there also similar trait-constellations could be observed (10). Similarly, in this paper several references have been given to show that the relations found

* As shown in unpublished work on Level of Aspiration, Persistence, Oscillation, Speed, Accuracy, etc., by H. Himmelweit, A. Petrie, and other members of the Department.

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by us between body-build and intelligence, etc., were also found by other investigators using normal subjects rather than neurotics.

Of particular interest in this connection is a study which came to hand only after the present account of our work had already been completed (*24a*). This research was carried out by a group of psychologists, psychiatrists, pediatricians and other biological experts on a group of fifty children over a period of three years; it was completed under the auspices of the Psychological Clinic, Harvard, and the Department of Child Hygiene, Harvard, and complements our own work in many ways.

Where we dealt with neurotics throughout, they dealt with normals; where we dealt with adults only, they dealt with children; where we dealt with large numbers of subjects in an inevitably rather superficial manner, they dealt with small numbers of subjects in a very intensive manner; where we used common psychological and psychiatric concepts in ordering our material, they used the concepts and terms introduced by H. A. Murray; where we used factorial methods, they used special methods of their own devising. If, in spite of these differences between our two approaches, similar results emerged, we may justifiably claim that the types delineated in our studies are of general validity, and of fundamental importance in the field of psychological classification.

When such a comparison is carried out, the similarity found between the results is very close indeed, particularly when allowance is made for differences in terminology. As it is impossible to review a book of over 700 pages in a few paragraphs, attention will here be drawn to only a few of the most important points of comparison.

In the first instance, Sanford and his collaborators give a table of intercorrelations of 18 body measurements, almost identical with those used by us; from this table they deduce the existence of two contrasted body-types: tall-narrow and wide-heavy. From the actual figures given by them, it is clear that these types are practically identical with our own leptomorph and eurymorph types.

Measurements of various autonomic reactions (pupillary size dilation, pallor, flushing, sweating, odour, acne, pulse, etc.) disclose the existence of a syndrome of autonomic imbalance, which is positively correlated with tall-narrow body-build, and negatively with wide-heavy body-build.

Both tall-narrow body-build and autonomic imbalance correlate positively with success in various tests of intelligence, and also with school abilities and cultural stimulation in the home. Wide-heavy body-build on the other hand correlates negatively with intelligence, school abilities, and cultural stimulation.

Lastly, tall-narrrow body-build and autonomic imbalance correlates positively with personality-syndromes characterized by self-sufficiency, guilt-feelings, remorse, and counteractive endocathection, this syndrome is clearly similar to our affective or dysthymic type-factor. On the other hand, wide-heavy body-build and lack of autonomic imbalance correlate positively with good fellowship, social feeling, and lively self-expression.

As the authors point out, " it is possible . . . to compose a broader picture of inner life, tallness, thinness, and parasympathetic response, and to contrast this picture with one of social responsiveness, shortness, wideness and absence of parasympathetic activity " (p. 528). The picture thus revealed agrees in many ways with that shown in our own work, which is schematically reproduced below:

TABLE VIII.

Body-build	Leptomorph .	Eurymorph
Clinical syndrome	Dysthymia .	Hysteria
Intelligence	High .	Low
Schooling	Good .	Bad
Autonomic activity	Unbalanced .	Normal
Work record	Satisfactory .	Unsatisfactory

While this table is at fault in presenting as absolute what are in fact only tendencies, and may thus be misleading unless carefully interpreted, there can be little doubt that these tendencies do in fact form two syndromes which are roughly identifiable not only in our neurotic army group, but also in groups different in age, social background, mental health, and the various other ways already enumerated.

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7. *Summary and conclusions.*—A factorial analysis was carried out on the intercorrelations of 18 body-measurements taken on 200 neurotic soldiers, and an Index of Body-Type derived from the results of this analysis. This Index was calculated for altogether 400 neurotic soldiers and for 100 non-neurotic soldiers, compared with other indices, and with somatoscopic ratings. Body-type as determined by the Index was correlated with some 200 psychiatric trait ratings on the 400 neurotic soldiers, and significant findings noted. The following are the main findings of this study:

(1) Two main factors, accounting together for 46 per cent. of the variance, are sufficient to account for all the correlations found within the limits of the probable error.

(2) The first factor appears to be one of general body-size, has positive saturations throughout, and accounts for 34 per cent. of the variance.

(3) The second factor appears to be one of specific body-type, has both positive and negative saturations, and accounts for 12 per cent. of the variance.

(4) An Index of Body-Type can be derived from the results of this analysis, which gives an accurate picture of the "type" to which the patient who is being measured belongs, the "type" being defined in terms of the curve of distribution of the indices.

(5) The indices are distributed roughly in accordance with the normal curve, markedly skewed towards the positive end.

(6) Of all the indices examined, the Index here suggested correlated best with an independent somatoscopic examination, the correlation being +0·962.

(7) The body-types isolated by the factorial analysis and by our Index are characterized respectively by a preponderant growth in length or a preponderant growth in breadth, and are shown to be similar in many ways to various classical types.

(8) For the sake of convenience, the continuous sequence of Indices has been split into three parts, using the +1 S.D. and the −1 S.D. levels as arbitrary marking-off points for three main types; these have been called the leptomorph, the mesomorph, and the eurymorph respectively, and are defined as having an Index of Body-Type of more than 1 S.D. above the mean, between +1 S.D. and −1 S.D. from the mean, and more than 1 S.D. below the mean respectively.

(9) Leptomorphs show a marked tendency towards the affective group of symptoms, i.e., anxiety, depression, and obsession, while eurymorphs show a marked tendency towards the hysterical group of symptoms.

(10) Eurymorphs tend to show a much more serious "level of abnormality," as defined by seriousness of present disease, and by hereditary and home factors, than do the other two groups.

(11) Leptomorphs tend to show a higher proportion of schizoid personality traits than do the eurymorphs.

(12) The neurotics as a whole are slightly more leptomorph than the normal soldiers examined, but the difference is not statistically significant.

(13) The neurotic group contains a significantly higher number of leptomorphs and eurymorphs and a significantly smaller number of mesomorphs than does the normal group.

We are indebted to the Medical Superintendent of Mill Hill Emergency Hospital for permission to make use of the clinical material. We also wish to thank the Army Authorities for permission to measure a sample of normal soldiers.

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APPENDIX.

Indices of Body-Build.

Pignet Index = Stature cm. (chest circumference, cm. + weight, kgm.).

Morphological Index is a modification of that of Wertheimer and Hesketh (1926):

$$\frac{\text{Symphysis height} \times 10^8}{\text{Transverse chest diameter} \times \text{sagittal chest diameter} \times \text{trunk length}}.$$

Stromgren Index = $-\cdot 04$ stature $+ \cdot 127$ transverse chest diameter $+ \cdot 156$ sagittal chest diameter.

The following indices are quoted by Tucker and Lessa (1940):

Bornhardt, A. $= \dfrac{\text{Stature} \times \text{chest circumference}}{\text{Weight}}$.

Rohrer $= \dfrac{\text{Weight} \times 100}{\text{Stature} \times \text{shoulder breadth} \times \text{sagittal chest diameter}}$.

Von Rohden $= \dfrac{\text{Symphysis height}}{\text{Chest circumference} \times \text{anterior trunk height}}$.

Lucas and Pryor $= \dfrac{\text{Bi-iliac diameter} \times 1{,}000}{\text{Stature}}$.

Pignet-Ver Vaeck $= \dfrac{\text{Weight} + \text{chest circumference} \times 100}{\text{Stature}}$.

Martin $= \dfrac{\text{Bicristal diameter}}{\text{Shoulder breadth}}$.

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CHARACTER ASSESSMENT FROM HANDWRITING.

By OLGA MARUM, Ph.D.Munich.

[Received September 14, 1944.]

GRAPHOLOGY, the theory and practice of diagnosing character from handwriting, is gradually developing from its initial stage, in which it had been the mysterious art of a few people who claimed to be especially gifted, into a science which can be taught and studied. The widespread mistrust of it is partly justified by this state of development. From a scientific point of view it needs more precision of method and terminology as well as corroboration of its results by objective methods. The description of the character as a whole and assessment of the significance of single features still depend to a large extent on the graphologist's experience and knowledge of human nature as well as on his stylistic abilities, and some other subjective factors. Moreover, only part of the accepted graphological interpretations have been based on inductive methods using statistical comparison, experiment and the like; for the rest, they have regarded handwriting as the more or less unwitting expression of the subject's personality, and they have attempted to assess this either by empathy, or by an effort to understand and explain which might itself be founded on the graphologist's private philosophy or on the psychoanalytical system. The results obtained in this way called for corroboration by statistical evidence. The present writer therefore welcomed Dr. Eysenck's suggestion to submit her graphological reports to objective control in the following way: She was to answer a questionnaire on the temperamental qualities of 50 neurotic patients, a sample of whose handwriting was given her, assess their intelligence, give a short character description, and, last of all, match the specimens of handwriting against anonymous summaries of the case-records of the patients. Her results were then compared with the patients' own answers to the questionnaire, their score in the Progressive Matrices Test, and the psychiatrist's description of the patient's character. Dr. Eysenck has reported the numerical results.* In the present paper the validity of the graphological opinion on personality traits confirmed by at least one of the sources of control will be examined, and the handwriting signs of these traits will be set forth.

I. *The Reflection of Neurosis in Handwriting.*

There are some advantages in the fact that the testing material was obtained from neurotic patients; if there had been a straight contradiction between the graphological analysis and the specific features of the neurosis (for example, if a patient with anxiety and depression had been described as daring, over-confident and pleasure-seeking), this would weigh heavily against the reliability of graphology. If, on the other hand, the specific traits of the neurotic state were mentioned in the graphological analysis as outstanding, or if they were at least not overlooked, this would serve to confirm to some extent the reliability of graphology. It may be stated in advance that contradictions of the kind just mentioned did not occur. There are, however, cases of discrepancy between the psychiatrist's and the graphologist's opinion which deserve special discussion. They seem to indicate that the doctor and the graphologist are not always aiming at the same layer of the personality; the graphologist may point to a deeper-lying trait, the doctor to a surface symptom. In such cases the graphologist, although not mentioning the surface symptom, gives the deeper reason for it. In other cases the neurotic traits them-

* "Graphology and Psychiatry: An Experimental Analysis," *Brit. J. Psychol.* (awaiting publication).

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selves may be only on the surface, without having penetrated into the personality; then they would not be noticeable in the handwriting.

1. *Depression.*

Depression, which was mentioned 32 times in the medical report, was always referred to by the graphologist. Where the term "depression" does not occur, which happened in 7 cases, the descriptions used—"worried," "afraid of reality," "lacking in self-confidence"—are akin to depression and compatible with it.

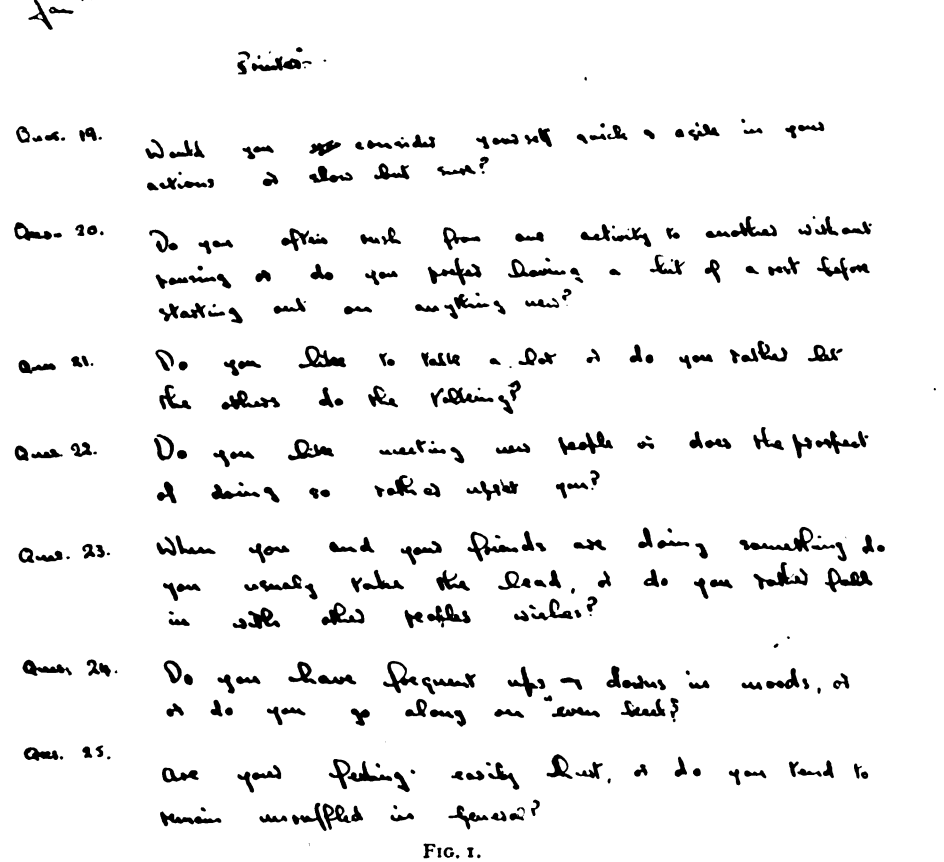

Fig. 1.

The graphological statement of depression was based on the following symptoms in the handwriting:* Falling or fluctuating lines, a heavy pressure or a particularly thin, timid and irregular pressure, slanting to the left and the signature placed towards the middle or the left half of the paper, small letters, diminished height of capital letters, corrections, slow writing. At least two of these qualities were combined whenever depression or a tendency towards it was stated (Figs. 1 and 2).

2. *Anxiety.*

The medical diagnosis anxiety was given in 38 cases. In the graphological sketch the term "anxiety" was used only three times, but descriptions like

* For the meaning of the technical terms describing the qualities of the handwriting the reader may refer to graphological text-books, e.g. Saudek, *Experiments with Handwriting*, London, 1929, or Jacoby, *Analysis of Handwriting*, London, 1939.

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27 When you are out with friends, do you enter into the fun whole-heartedly, or do you tend to be rather quiet and withdrawn.

28 Would you like to go through thrilling experiences and adventures yourself, or do you prefer reading about them or seeing them at the pictures.

FIG. 2.

2/Bdr

20. Do you offer rush from one activity to another without pausing for a rest, or do you prefer having a bit of a rest before starting out on anything new?

21. Do you like to talk a lot, or do you rather let the others do the talking

22. Do you like meeting new people, or does the prospect of doing so rather upset you?

23. When you and your friends are doing something, do you usually take the lead, or do you rather fall in with other peoples wishes?

24. Do you have frequent ups and downs in mood, or do you go along on an even keel?

25. Are your feelings easily hurt, or do you tend to remain unruffled in general?

26. Do you tend to express such emotions as delight, sorrow, anger, etc. readily, or do you feel that it would never do to exhibit your emotions publicly?

27. When you are out with friends, do you enter into the fun whole-heartedly or do you prefer to be rather quiet and withdrawn

28. Would you like to go through thrilling experiences yourself, or do you prefer reading about them or seeing them at the pictures. W.

FIG. 3.

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" tendency to worry," " fear of the future," " lack of security," point to the pathological state in the other cases. Question 5 of the questionnaire* has a special significance for anxiety cases. The graphologist's answer to this question was

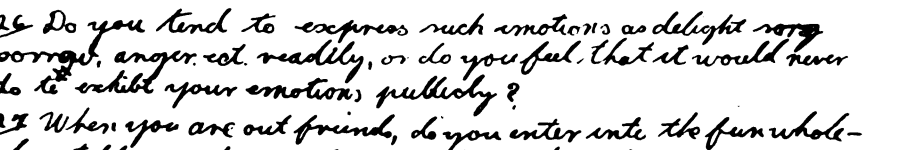

FIG. 4.

" Inclined to worry over possible misfortunes " in all cases but one. This one case is Bai. (Fig. 3). It is a case of—

" Acute anxiety due to very severe enemy action on three fronts—France, Greece and Libya. The patient had been exposed to continuous bombardment,

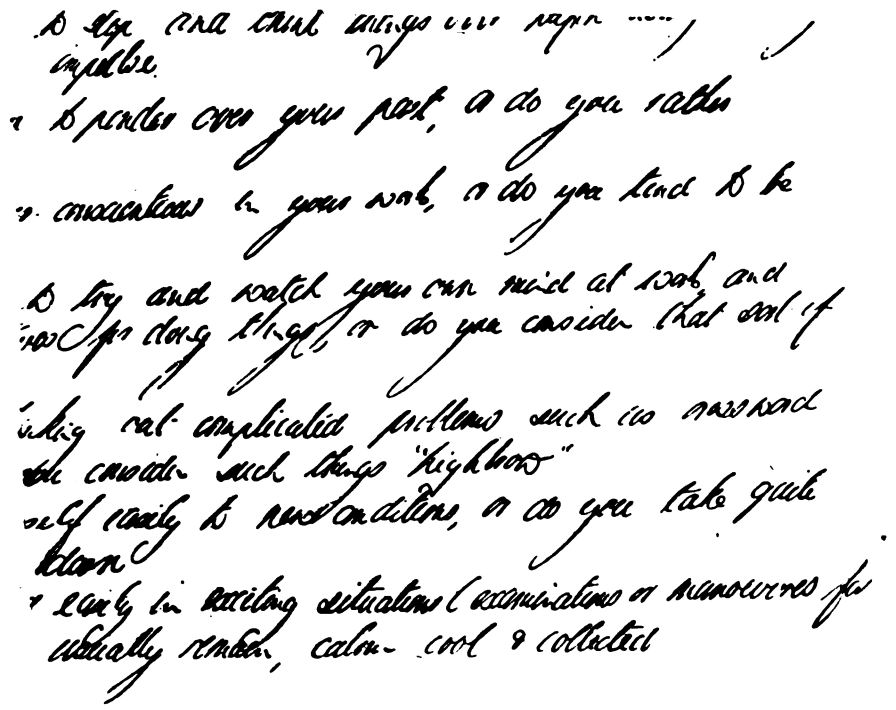

FIG. 5.

had lost his best friend and had been buried several feet in the ground. There are no signs of neurosis in his history before these events."

This may be a case in which the deeper layers of the personality have not been affected by the pathogenic experiences.

In the handwriting of anxiety cases the narrow distance between words and lines is characteristic. The words end abruptly; the ellipses (in o, a, g, etc.) may be

* P. 40.

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"compressed" by the next letter; the lines begin at the extreme left without a margin. The signature may be found on the left half of the paper; slant and flourishes may be to the left; the pressure is either heavy or there are irregular losses of pressure; the writing is small and slow, with occasional abrupt loss of height. Two or more of these features were combined in each of these cases of anxiety (Figs. 4 and 5).

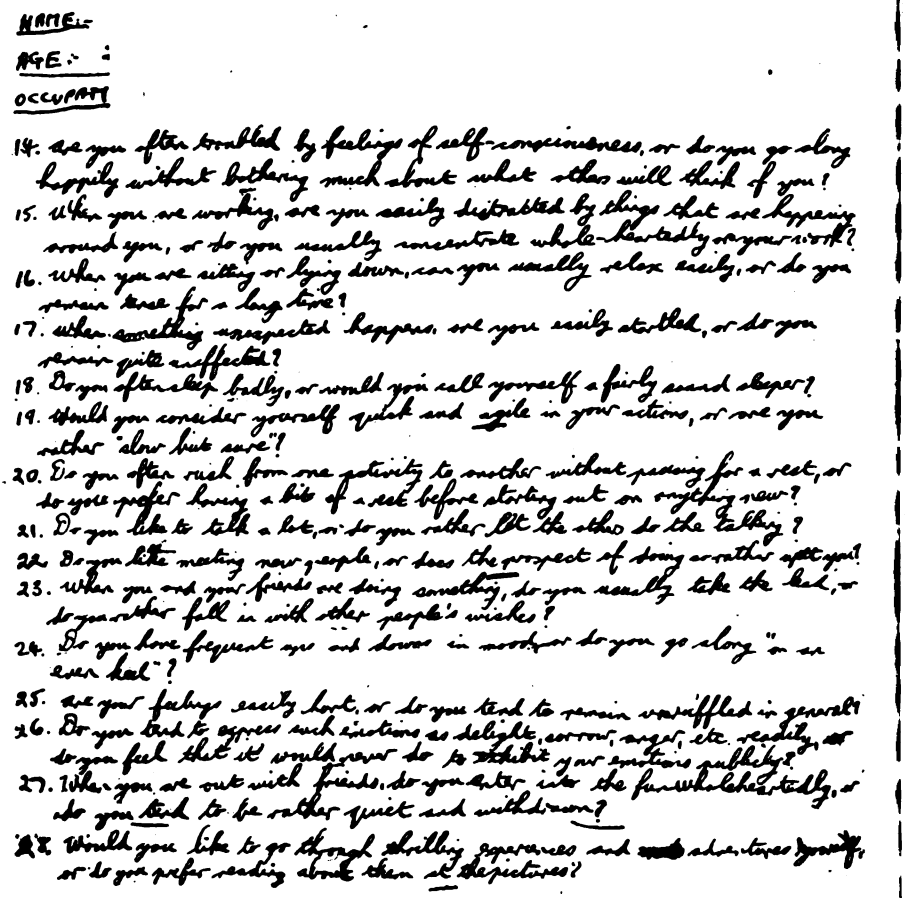
NAME:-
AGE:-
OCCUPATN
14. Are you often troubled by feelings of self-consciousness, or do you go along happily without bothering much about what others will think of you?
15. When you are working, are you easily distracted by things that are happening around you, or do you usually concentrate whole-heartedly on your work?
16. When you are sitting or lying down, can you usually relax easily, or do you remain tense for a long time?
17. When something unexpected happens, are you easily startled, or do you remain quite unaffected?
18. Do you often sleep badly, or would you call yourself a fairly sound sleeper?
19. Would you consider yourself quick and agile in your actions, or are you rather "slow but sure"?
20. Do you often rush from one activity to another without pausing for a rest, or do you prefer having a bit of a rest before starting out on anything new?
21. Do you like to talk a lot, or do you rather let the other do the talking?
22. Do you like meeting new people, or does the prospect of doing so rather upset you?
23. When you and your friends are doing something, do you usually take the lead, or do you rather fall in with other people's wishes?
24. Do you have frequent ups and downs in mood, or do you go along "in an even keel"?
25. Are your feelings easily hurt, or do you tend to remain unruffled in general?
26. Do you tend to express such emotions as delight, sorrow, anger, etc. readily, or do you feel that it would never do to exhibit your emotions publicly?
27. When you are out with friends, do you enter into the fun wholeheartedly, or do you tend to be rather quiet and withdrawn?
28. Would you like to go through thrilling experiences and adventures yourself, or do you prefer reading about them or pictures?

FIG. 6.

3. *Obsessional Neurosis.*

There were seven cases of obsessional neurosis in the material at the author's disposal. Five of them were described in the graph-sketch as "over-conscientious," "circumstantial and ceremonious," "tries to check himself constantly," "keeps constant watch on his words and expression," "acts under constant compulsion," "under self-imposed restrictions," "not free and natural." The two cases in which the graphologist did not refer to the obsessional features have to be regarded as failures; they show characteristic traits which have been overlooked. These traits are: Regularity and rigidity combined with some artificiality of style, narrowness, small letter formation, touched-up letters, perpendicular direction or slant to the left or irregularity of the slant; wide distances between the words, combined with narrow letters, or extremely small distances between words and lines (Figs. 6 and 7).

Fig. 7 shows the writing of a case of "severe obsessional bouts centering round figure 13": all the figures but 13 are underlined by a short upward stroke to the right, proving the mind's influence on the way of writing. No need to emphasize

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that such a phenomenon only allows for a guess, and not for a diagnosis of the underlying mental cause.

4. *Hysteria.*

Nine cases are diagnosed as hysteria, three of them of the conversion type, and in six more cases hysterical features are mentioned in cases of anxiety, epilepsy or

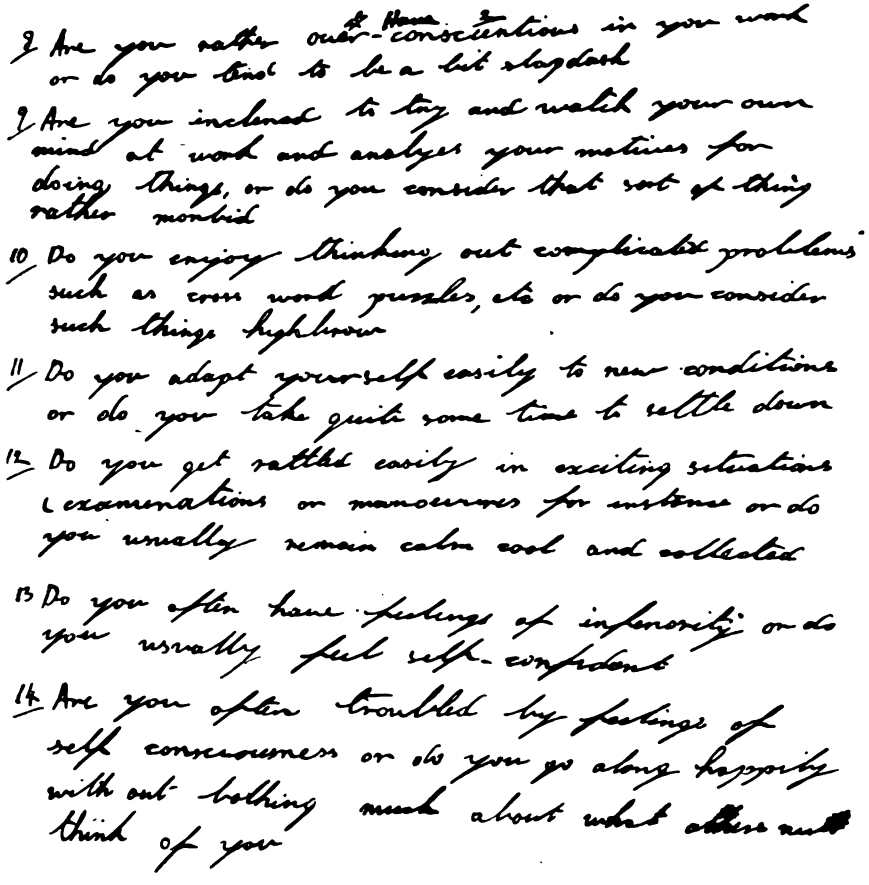
9 Are you rather over-conscientious in your work
or do you tend to be a bit slapdash
9 Are you inclined to stay and watch your own
mind at work and analyse your motives for
doing things, or do you consider that sort of thing
rather morbid
10 Do you enjoy thinking out complicated problems
such as cross word puzzles, etc or do you consider
such things highbrow
11 Do you adapt yourself easily to new conditions
or do you take quite some time to settle down
12 Do you get rattled easily in exciting situations
(examinations or manoeuvres for instance or do
you usually remain calm cool and collected
13 Do you often have feelings of inferiority or do
you usually feel self-confident
14 Are you often troubled by feelings of
self consciousness or do you go along happily
without bothering much about what others may
think of you

FIG. 7.

reactive depressive states. In the respective graphological sketches the following characteristics are mentioned:

Lack of self-confidence or self-reliance .	in all the	15 cases.
A desire to domineer or to be "in the limelight" . .	in	8 ,,
Lacking in stability	,,	8 ,,
Emotional, excitable, impressionable	,,	11 ,,
Afraid of reality; wants protection	,,	6 ,,
Cannot reach a decision; torn between opposed tendencies	,,	5 ,,
Self-centred; cannot form an objective opinion . .	,,	5 ,,
Imitative; likes acting; is versatile	,,	4 ,,
Irritable	,,	4 ,,
His feelings do not go deep	,,	2 ,,

At least two of these features were stated in each case in which the doctor found hysterical tendencies; in four cases there were from five to seven of them.

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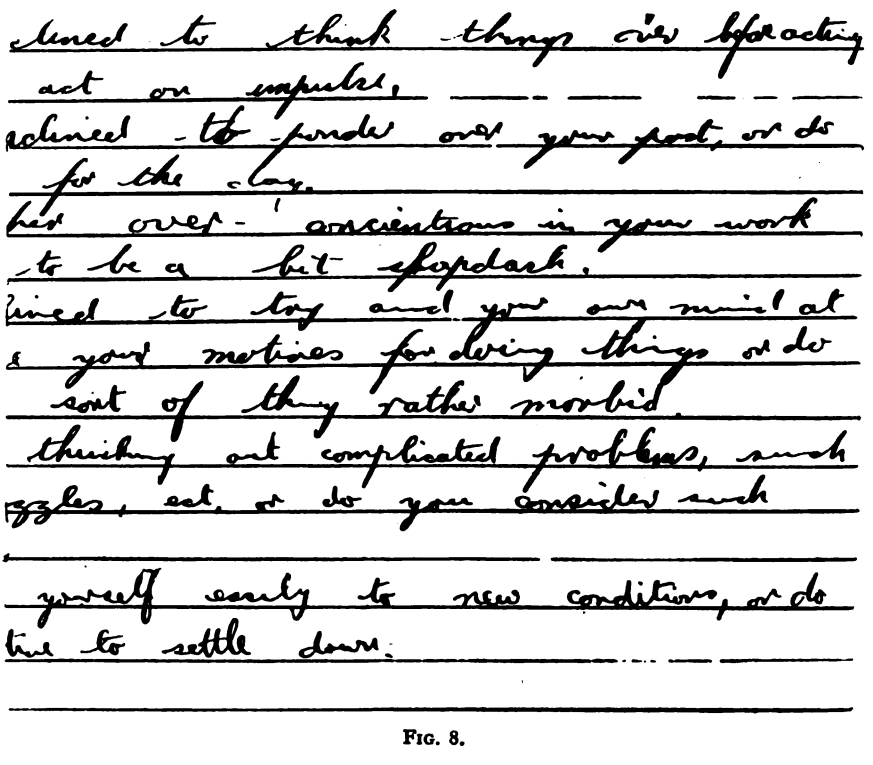

FIG. 8.

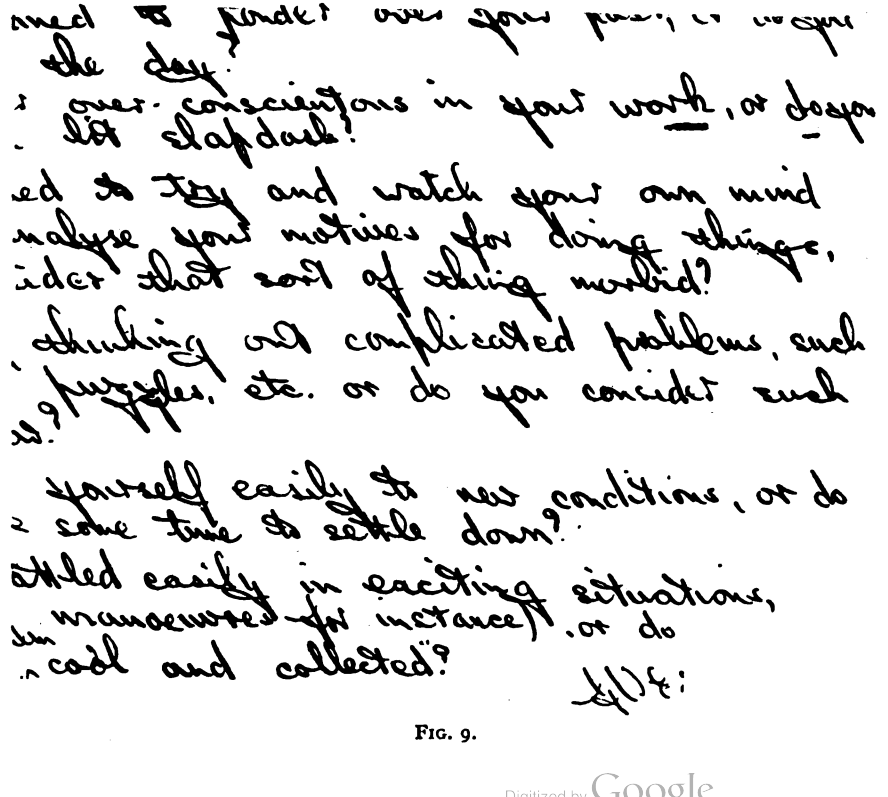

FIG. 9.

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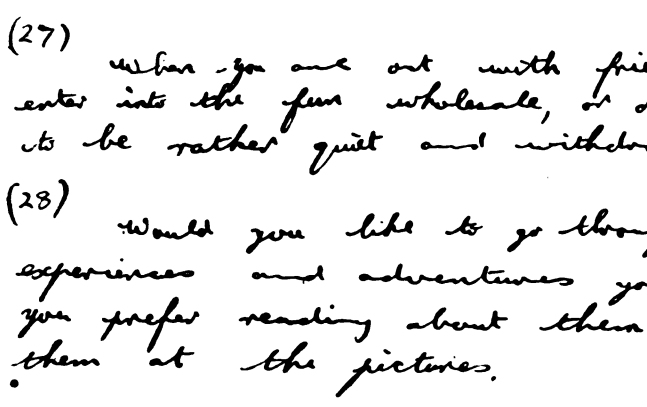
The handwriting of the hysterics appears to be of two different types: Either it is characterized by irregularity of height, width and slant, fluctuation of the lines, indistinct, mixed ligature (Fig. 8), or by a grotesque slant to the left, exaggerated flourishes, heavy pressure, covering strokes, irregular connectedness and lack


(27) When you are out with friends, do you enter into the fun wholesale, or do you tend to be rather quiet and withdrawn.

(28) Would you like to go through thrilling experiences and adventures yourself, or do you prefer reading about them or seeing them at the pictures.

FIG. 10.

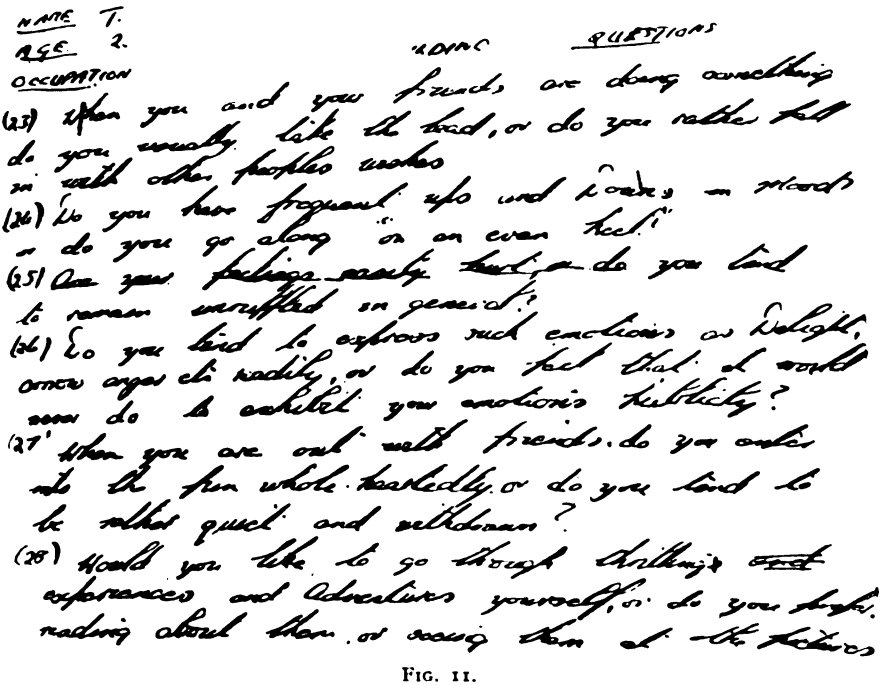

NAME T.
AGE 2.
OCCUPATION
ADDNL QUESTIONS
(23) When you and your friends are doing something do you usually like it best, or do you rather like to be with other peoples wishes
(26) Do you hear frequent echo and words in your head or do you go along as an even keel?
(25) Can you [illegible] do you tend to remain unruffled in general?
(26) Do you tend to express such emotions as delight, anger etc readily, or do you feel that it would seem to exhibit your emotions publicly?
(27) When you are out with friends do you enter in the fun wholeheartedly or do you tend to be rather quiet and withdrawn?
(28) Would you like to go through thrilling experiences and adventures yourself, or do you prefer reading about them or seeing them at the pictures

FIG. 11.

of proportion in the accentuation of some letters, particularly initials (Fig. 9). No single symptom can be regarded as indicating hysteria: at least five of them were found to be combined in each of the cases at the author's disposal.

The only case of "amnesia and hysterical fugues" is described in the graphsketch as "able to imitate people to the point of losing his personality." It belongs

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to the first type of hysterical writing—showing great irregularity, threadlike ligature, covering strokes, broken letters and fluctuation of the lines (Fig. 10).

The psychological difference corresponding to the two types of handwriting is the following: The first type is lacking the mental energy and determination needed to complete his emotional development. The second type is overstraining his energy in the effort to repress the normal emotional development, of which he is frightened.

5. *Epilepsy.*

In the two cases of epilepsy—none of which was of "epileptic character"—the graphological sketch refers to the losses of consciousness. The basis for this statement is a sudden deficiency of the writing pressure.* The same phenomenon was, however, observed in three cases of hysteria and anxiety in which occasional losses of consciousness were said to occur. From the handwriting it does not seem possible to distinguish between these different causes for loss of consciousness (Fig. 11*a*).

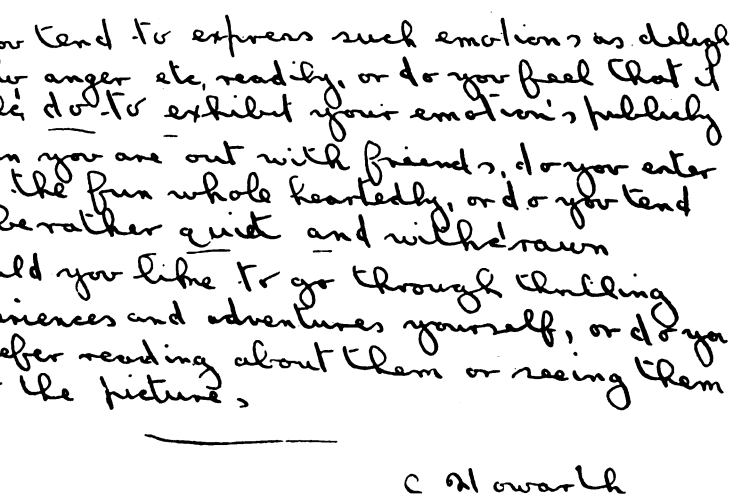
26 Do you tend to express such emotions as delight sorrow anger etc readily, or do you feel that it would be best to exhibit your emotions publicly
27 When you are out with friends, do you enter into the fun whole heartedly, or do you tend to be rather quiet and withdrawn
28 Would you like to go through thrilling experiences and adventures yourself, or do you prefer reading about them or seeing them at the picture,
C Howarth

FIG. 11*a*.

6. *Psychopathic Personality.*

Two cases are described by the doctor as schizoid personalities, three more as psychopathic. The graphologist's description of one of the schizoids is: "He is wearing a mask to conceal his own weakness, his instability and lack of energy . . . the habit of concealing his inner life and his true nature made him afraid of contact . . . he is also indulging in delusions . . . in practical life he finds people and circumstances hostile to himself; he cannot understand people; he is reserved and wants others to respect his secretiveness."

The graphic symptoms of these character traits are: A rigid, unnatural handwriting, sloping to the left, covering strokes in the middle zone, some tendency to threadlike ligature, exaggerated loops in the lower zone, discrepancy between text and signature, increased height of letters in the middle zone at the end of words, large distances and horizontal strokes between words (Fig. 12). The first five of these symptoms are also to be found in the second case of schizoid personality. In this case the secretiveness was also stressed by the graphologist (Fig. 13). The other psychopaths are described as "excitable," "irritable," "restless," "unsteady," "autistic," "full of opposition," "emotionally primitive with ideas out of all proportion."

* *Cf.* Cyril Burt, *The Backward Child*, London, 1937, fig. 4, p. 196.

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1/ Are you interested in sports or in intellectual things?

2/ Do you particularly dislike being "bossed", or do you generally do as you are told, without feeling rebellious?

3/ Do you usually "kick up hell" when you are not getting a square deal, or do you usually just shrug your shoulders and say, "oh, it doesn't matter"?

4/ Do you enjoy being in a position where you can give orders, or do you dislike having such responsibility?

5/ Do you consider yourself a happy-go-lucky individual, or are you inclined to worry over possible misfortunes?

6/ Are you inclined to stop and think things over before acting, or do you often act on impulse?

7/ Are you inclined to ponder over your past, or do you rather "live for the day"?

FIG. 12.

have frequent ups and downs in mood, or go along "on an even keel"?

feelings easily hurt, or do you tend to be miffed in general.

not to express such emotions such as sorrow, anger, etc readily, or do you - if bored him do to exhibit your publicly?

Are out with friends, do you enter into whole-heartedly or do you tend to be quiet and withdrawn

You like to go through thrilling experiences yourself, or do you prefer reading about

FIG. 13.

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Conclusion.

It seems to be borne out by this survey that specific combinations of certain traits of the handwriting correspond to the different kinds of neurosis and psychopathy as represented in the 50 cases at the author's disposal. To claim more would be premature.

II. *The Reflection of Character Traits in Handwriting.*

1. *Emotionality and Calmness.*

Questions 12 and 17 of the questionnaire, aimed directly at the subject's emotionality, excitability or its opposite, calmness and collectedness. On question 12, which was answered by 49 patients, the graphologist's and the patient's opinion agree in 38·5 cases, they disagree in 8·5 cases. On question 17 there is agreement in 43, disagreement in 5 cases. The doctor's description refers to these features of the patient's character in 36 cases, 32 of which agree with the graphologist's description; 4 cases seem to contradict the graphologist. In one of them the patient himself gives the explanation by saying: "Outwardly I keep cool, inwardly I get rather rattled." The handwriting indicates that he is easily startled and knows bursts of temper between periods of calmness. The doctor describes him, however, as "even tempered." Nevertheless, in the case-history there is a remark that he had "fits of crying when reprimanded" and that he was "depressed upon admission." The other cases are similarly complicated; the graphologist points out that although the patient is irritable and excitable, he wants to appear self-controlled and calm; that he restricts himself successfully. Since the answers to the questionnaire suppose "exciting situations" or "unexpected happenings" they conform to the graphologist's description but not to the doctor's, which is based on the patient's everyday behaviour. In these cases, again, doctor and graphologist are dealing with different layers of the personality.

On the question of calmness, the patients' and the graphologist's opinion differ in six cases; in one of these the doctor also puts the graphologist in the wrong, whilst in the other five cases the doctor supports the graphologist by describing the patient as "restless," "extremely irritable," "subject to futile rages" and the like. A mistake on the side of the patients seems here very likely.

From these facts the graphological diagnosis of excitability and irritability on the one hand, calmness on the other, appears to be well founded.

It was based on the following features of the handwriting:—(Emotionality): Irregularity of height, slant and width of the letters, irregular degree of connectedness, frequent touching up of letters, extreme slant to the right, pointed loops below the line, neglect of the shape of letters (Fig. 10). (Calmness): Sharpness of the stroke combined with some regularity and thinness, particularly of the i-dots (Fig. 11).

In the complicated cases the lack of homogeneity is outstanding; the signature is quite different in style from the text; the writing is careful and slow, but not consistently so; it sometimes degenerates in the same specimen into hasty and primitive forms, or it shows other symptoms of contradictory significance (Fig. 14).

2. *Intelligence.*

The intellectual qualities which can be discovered from the handwriting are: Ability or inability to combine facts, to detect relations, of thinking clearly and of expressing thoughts clearly. These qualities ought to show some correlation to those examined by the Matrix Test. As a matter of fact, however, there was no satisfactory correlation between the achievements at the Matrix Test and the graphological assessment of intelligence. Table I shows the number of cases in which the ranking of the intelligence according to graphological assessment and to the Matrix Test agree or disagree. Both rankings divided the cases into four groups of intelligence:

TABLE I.

	Graphological.	Test.	Agreement.	Difference.
Group I	4 cases	4 cases	in 2 cases	in 2 cases
Group II	14 ,,	11 ,,	,, 5 ,,	,, 9 ,,
Gorup III	25 ,,	27 ,,	,, 14 ,,	,, 13 ,,
Group IV	7 ,,	8 ,,	,, 0 ,,	,, 8 ,,
	50	50	21	32

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The graphological assessment is—

Three groups	higher than	the test	in	1 case.
,, ,,	lower ,,	,,	1	,,
Two ,,	higher ,,	,,	2	cases.
,, ,,	lower ,,	,,	1	case.
One group	higher ,,	,,	13	cases.
,, ,,	lower ,,	,,	11	,,
			29	cases

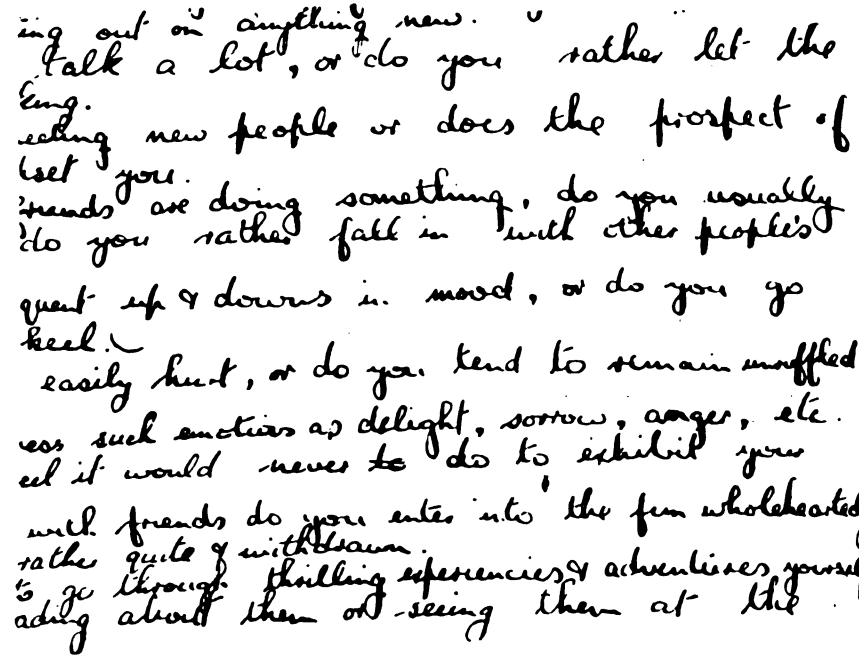

FIG. 14.

This rather discouraging result may have three different causes: Either graphology is not fitted for judging intellectual abilities, or the present writer was mistaken in applying it, or, lastly, the abilities measured by the Matrix Test are not as closely related to the subject's intellectual abilities as was presumed.

One particular symptom in the handwriting—the frequent interruption of the stroke (within one word) and the subsequent "jointing" or "patching" (Fig. 12)—may have been overrated by the graphologist. It is supposed to indicate that the subject is not capable of comprehending logical relations, of combining and deducing, and thus of intelligent understanding and acting. From the present material it seems that this symptom is actually not always a sign of impaired intelligence. Finer distinctions will have to be made to ascertain when this is the case and when not.

It is also worth noticing that of the eight patients with I.Q.4 according to the Matrix Test, all of whom were classed higher by the graphologist, two won a scholarship at school, one was "quite a good scholar and almost won a scholarship," one "was very good at school, where he reached the top standard," one was sent from the elementary school to a secondary school at the age of 12, and two more left the school at 14 after reaching the top standard. Only one "who missed school a lot left at 13 after reaching Standard V." Since in normal cases the correlation between achievements in the Matrix Test and at school has been found to be positive* the inference suggests itself that the neurosis may have some bearing on

* Cf. Raven, Bibliography No. 77.

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this state of affairs; that the intellectual ability of these patients may be higher than their performance in the Matrix Test.*

Conclusion.

The graphological assessment of intelligence needs more subtle methods based on further research. It ought to be checked by tests obtained from normal subjects before a verdict as to its reliability can be given.

III. *The Attitude Towards Self.*

Self-centredness with or without hypochondriacal features was found by the doctor in 24 cases, by the graphologist in 15 of these, whilst in two more cases " lack of understanding for other people " is said to be revealed by the handwriting.

The graphic signs for egocentrism are: A combination of exaggerated initials with either general slant to the left or flourishes and t-bars which are turned to the left, predominance of the zone below the line, large distances between the words, large letters or great extension of long letters, increased height at the end of words in the middle zone. The first of these symptoms has always been found to be accompanied by one or more of the others in our material. It is, however, usually regarded as sufficient evidence for self-centredness, particularly when appearing in the signature (Fig. 9).

Lack of self-confidence has naturally been a frequent feature in our material. Questions 13 and 14 of the questionnaire are referring to it. The doctor's, the graphologist's and the patients' opinion on this point compare as follows:

All three agree	in	24 cases.
Doctor and graphologist agree; patient only half confirms it	,,	8 ,,
Graphologist and patient agree; doctor does not mention it	,,	4 ,,
Graphologist and patient agree against doctor's opinion .	,,	2 ,,
Doctor and patient agree, against graphologist's opinion .	,,	3 ,,
Impairment of self-confidence was stated. . .	in	41 cases.

The last two cases† were diagnosed as anxiety cases, which corroborates the graphologist's opinion.

The graphic signs for lack of self-confidence, part of which has been mentioned in the discussion of anxiety, are:—A combination of three or four of the following features: narrow letters, slant to the left, pressure and slow movement; downstrokes which are broken above the line, irregular space between the words, full stops within the words, mixed or threadlike ligature, " écriture suspendue," signature placed on the left half of the paper and on the lower edge, great difference between extension of middle, upper and lower zone, predominance of lower zone, abruptly small endings, accentuation of initials, stylized, artificial writing (Figs. 1, 4, 5 and 6).

Inner conflict is mentioned in 16 of the graphological sketches; the doctor's report confirms it in 8 of these; in no case does it contradict it. The corroborating remarks refer to the patient's obsessional traits (four times), to the state of tenseness (twice, which in one case is " due to a tendency towards self-criticism on the basis of a feeling of insecurity " according to the graphologist, whilst the doctor puts it to " the fact that the patient realizes his difficulties "). In two further cases the graphologist's description is of a more general character than the doctor's. It does not give the details which the doctor knows, but it does not contradict them; in the second case it points to the explanation of the surface symptoms. The cases are:—(1) (Fre): Doctor: " Patient is at war with himself, self-reproachful." Graphologist: " He compels himself to caution." (1) (Dun): Doctor: " Patient is a heavy drinker; his drinking is increasing." Graphologist: " He wants to eascape from his own self." (Fig. 15.)

The graphic features indicating inner conflict are: Irregularity of the slant, the ligature, the width of the letters and the distances between the words. Some

* Babcock, Bibliography No. 74; Eysenck, Bibliography No. 76.

† The doctor's and the graphologist's opinions correspond slightly better with each other than with the patients'.

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of these irregularities are always combined and provoke the impression of unevenness. There is sometimes also rigidity and narrowness as well as interruption of the fluency of the writing to be found in addition to the high degree of irregularity.

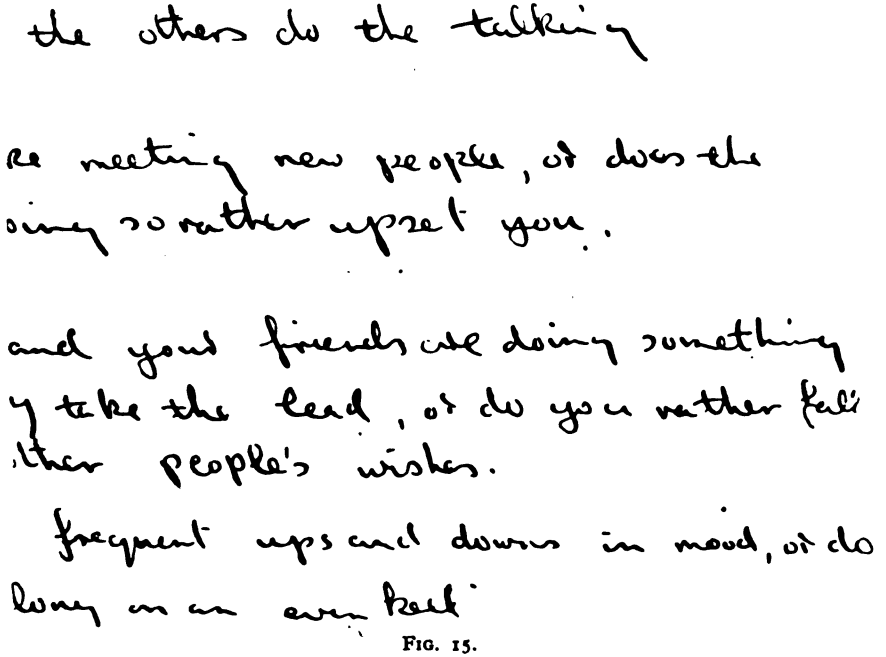

FIG. 15.

IV. *The Attitude Towards Other People.*

About the patients' social attitude the doctor's and the graphologist's opinion can be compared with the patients' answers to questions 22 and 27 of the questionnaire. The graphologist found 19 patients to be of a sociable nature. Table II shows the doctor's and the patients' opinion compared with the graphologist's.

TABLE II.—*Sociability.*

	Doctor's remark.	Qu. 22.	Qu. 27.	Graph.
Positive	14	11	12 + 2½	19
Negative	4	6	4	—
Not clear	1	2	1	—
	—	—	—	—
	19	19	19	19

Again the graphologist's and the doctor's opinion correspond slightly better to each other than to the patients'.

Some cases are described by the graphologist as extravert by nature, but having become solitary and reserved in the course of their experience. Two of the patients gave different answers with regard to the change of their reactions since they joined the Forces. In other cases one cannot be certain whether the answers refer to the normal or to the present pathological state of mind. The case-sheets also sometimes contain contradictory statements: The personality is, for instance, described as "cheerful, a good mixing type," which statement has probably been based on the patient's own report at the anamnesis, and in the subsequent "history" the same patient is said to be "depressed, worried and seclusive."

Sociability shows itself in the following qualities of the handwriting: Garland or threadlike ligature, slant to the right, left margin increasing, loops in upper region narrow or missing, t-bar to the right of the letter longer than to the left; i-dots extended into strokes, in advance of the letter to which they belong; rather

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wide letters, considerable distance between the letters, but distance between the words neither narrow nor wide; lines ascending to the right; letters within the words connected, sometimes also two consecutive words connected; ovals open at the top, certain flourishes. At least two or three of these symptoms were found combined in the handwritings of sociable patients.

Table III shows the opinions on shyness, timidity, solitariness derived from the different sources. There are 40 cases, nine of them only temporarily unsociable.

TABLE III.—*Shyness, Timidity, Solitariness.*

	Doctor's remark.	Qu. 22.	Graph.
Not sociable	32	27 + 2½	38 + 2½
Sociable	7	4 + 2½	2½
Not clear	1	7	—
	40	40	40

Five cases of aggressiveness are included in Table III, because this is also an unsociable feature and, moreover, one which may be regarded as an overcompensation of timidity, whilst, on the other hand, timidity may develop on a basis of aggressiveness. This is, for instance, the case with Bat, who is described by one doctor as "timid and faints at the sight of blood," whilst a second doctor writes: "He is pleasant, courteous and eager to help . . . he is fundamentally aggressive, but suppresses most of his aggressive tendencies, and as a result appears submissive and rather timid." The graphologist's opinion is: "He is sometimes harsh, critical and aggressive, but he is sociable nevertheless . . . he is intimidated."

A combination of at least three of the following features in the handwriting indicates timidity, difficulty in making contact, difficulty to adapt and the like: Narrowness of the letters or irregularity of the width of letters; covering strokes; a peculiar shape of the ellipses so that they looked "squeezed," slow small writing, unconnectedness, dots within the words; the ends of the words are particularly revealing; the endstrokes may be missing, or pointing to the left instead of the right; the last downstroke may be arrested above the line (écriture suspendue); in the middle zone the last downstroke may be larger than the others, steeper than the beginning of the word; distances between the words may be considerable (Fig. 1).

The symptoms of aggressiveness imply sharpness of the strokes and sharpening of the ends: Pointed horizontal bars at t's or extended and pointed bars, pointed downstrokes in a sharp handwriting, endstrokes which rise diagonally upwards, pointed strokes and increased pressure at the end of words (Fig. 6).

The graphological sketch speaks of "dependence" in 10 cases. In two of these there is no reference to this quality by the doctor. In four of the remaining eight cases doctor and graphologist use the same expression; in the other four their description tends into the same direction. For instance (Led): Doctor: "Lacking in initiative." Graphologist: "Weak; depends on other people's decision." At least two of the following symptoms were found in the handwriting of "dependent" subjects: Threadlike ligature or mixed ligature plus thread, irregularity, especially extreme irregularity of the slant, extreme slant to the right, increasing length of the upper zone (as a symptom of the desire for recognition by others) and slant to the left(as a symptom of need of love and protection).

V. *The Attitude Towards Work.*

Initiative; ambition.—In eight cases the doctor and the graphologist refer to the patient's initiative and ambition. In six of these there is full agreement. One case is somewhat complicated; it is a case who is described by two doctors. The first states that the patient is active, the second that he has no initiative; the graphologist that "his ambitions are not satisfied," but that he is "ambitious and keen." The remaining case is called "ambitious" by the doctor, "aggressive" by the graphologist—which is no contradiction.

The graphic symptoms are: For initiative, straight lines or lines leading straight upwards, some width, no loops in the middle zone; for ambition, increasing length

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of the letters in the upper zone, large and narrow letters, particularly above the line, enlarged initials, long and thick horizontal bars (Fig. 16).

Lack of initiative is mentioned by the doctor and by the graphologist unanimously in six cases; in two cases there is no conformity—the one has been mentioned above (p. 36) as complicated, the other one is the only case of left-handedness (Fig. 14).

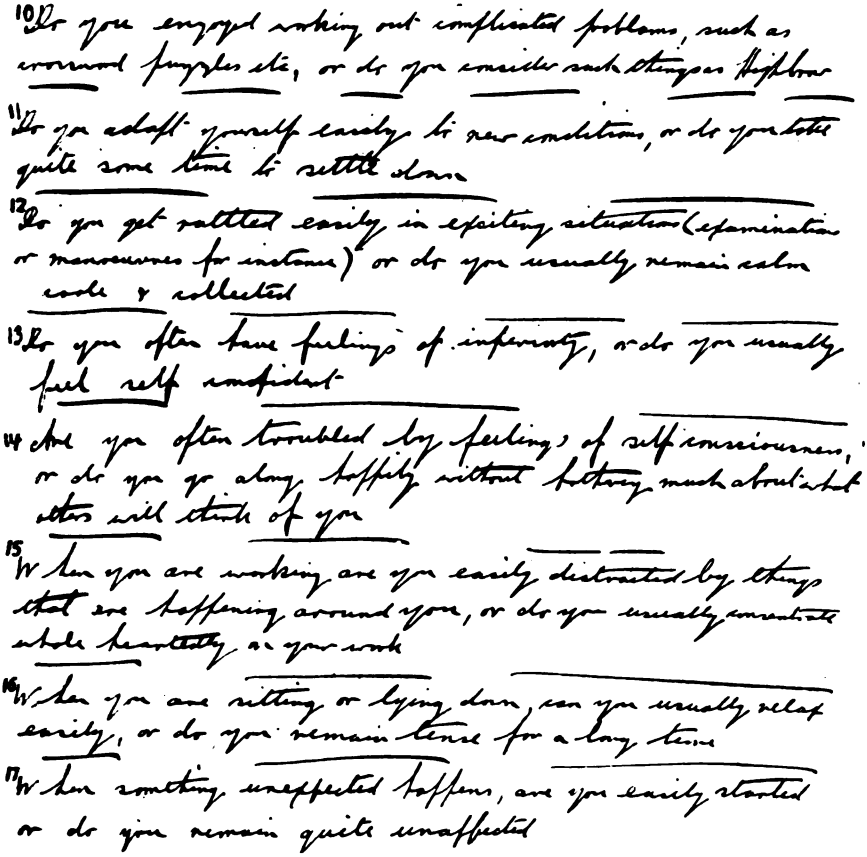

FIG. 16.

The graphic signs for lack of initiative are: Symptoms of inhibition, such as slant or otherwise increased tendency to the left, narrowness, pressure, together with slowness, signature placed on left half of page, possibly at the lower edge, combined with symptoms of lack of energy, such as irregular slant and pressure, mixed ligature and threadlike ligature.

Conscientiousness; care about detail.—Question 8 of the questionnaire deals with conscientiousness at work. A comparison of the patients' and the graphologist's answers to question 8 shows:

Full conformity	in 31 cases.
Of these the subject is "conscientious" in 29 cases.	
"slap-dash" ,, 2 ,,	
Patient calls himself "conscientious," graphologist contradicts	,, 13 ,,
Patient says he is inclined to sacrifice accuracy for speed; graphologist calls him conscientious	,, 1 case.
Indefinite answers	,, 5 cases.
	50 cases.

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Looking at these figures one cannot help the impression that these patients are somewhat unwilling to admit that they are slap-dash at work; only 3 out of 50 own up to it, whilst the graphologist found this attitude in 15 cases. Maybe that the patients being members of the Forces has something to do with this disinclination. The graphologist's statements on conscientiousness need checking by another than the questionnaire method before a verdict on their reliability can be given.

The doctor mentions conscientiousness in six cases, in five of which he is in full agreement with both the graphologist's and the patient's opinion. In the last case symptoms of irritability and impatience which were combined with symptoms of conscientiousness led the graphologist to assume that he was rather slap-dash at work. The patient's answer to question 8 confirms the doctor's opinion.

The handwriting of people who are conscientious at work shows the following characteristics: It is a slow, small handwriting with a certain degree of pressure; it is legible; the strokes below the line are of equal, medium length; the signature is simple, clear, with a full stop behind it; the details of the letters are minutely executed; flourishes are also carefully executed; letters and particularly mistakes are touched up after the word is finished; sometimes the school model form of letters is observed. Naturally, some symptoms of anxiety and obsessional neurosis are also symptoms of conscientiousness (Fig. 1).

Negligence at work was stated when the handwriting showed symptoms of lack of self-control, such as a high degree of irregularity of the height and the slant of letters, irregularly oscillating lines, combined with symptoms of lack of patience, such as pointed loops below the line, and direct neglect of detail in the formation of the letters, such as omission of hooks in letters like f, of dots or of other details, so that the legibility is impaired (Fig. 8).

Responsibility.—In six out of seven cases in which responsibility is mentioned by both the doctor and the graphologist there is agreement; in one the graphologist contradicts the doctor. Question 4 of the questionnaire, putting the accent on the social position usually connected with a responsible job, is referring to timidity as much as to responsibility. Question 4 has been answered by the patient and the graphologist in a positive sense in 14 cases; in four more cases the patient states that he enjoys being in a responsible position whilst the graphologist contradicts him; in one of these cases the doctor's description confirms the graphologist's opinion.

A negative answer has been given to question 4 by 32 patients, but only in 10 of these cases was the graphologist of the same opinion.

The graphic symptoms for responsibility are the same as those for conscientiousness, combined with symptoms for steadiness of purpose, such as an at least medium degree of regularity, and for a tendency to independence, such as straight upward pointing endstrokes.

The graphologist has underrated the patients' fear of responsibility.

Distractibility.—Question 15 of the questionnaire deals with distractibility. Patient and graphologist agree on this question in 25 cases; in 22 on the fact of great distractibility, in 3 on a high degree of concentration. Forty patients regarded themselves as "easily distracted by outward happenings," whilst the graphologist found this characteristic in 28 patients only. The cases in which the two opinions differ are all instances of either anxiety or depression. This may have influenced the answers in so far as it predisposed the patients to taking a poor view of themselves. Moreover, the question is vague; the answer might refer to the patient's civilian work as well as to his work in the Army. If the lack of concentration is not of pathological degree, the subject may well be able to concentrate on his vocation or hobby whilst easily distracted when doing uncongenial work, such as he may have to perform in the Forces. The graphologist directly observes the degree of concentration and perseverance exerted during the process of writing. The writing was produced in circumstances which excluded disturbance from the outside. It is, therefore, evident that distractibility would be recognizable in the handwriting only of outstanding pathological cases, which are, of course, those which the questionnaire wants to find out. The graphic symptoms for distractibility comprise those for negligence, but the degree of irregularity is even higher; i-dots and t-bars are sometimes high, sometimes low above the line, the strokes are interrupted, and there are frequent spelling mistakes which are touched up. There is no even flow of the writing movements; the rhythm is disturbed.

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Summary.

The handwriting of 50 neurotic patients was submitted for graphological analysis. The graphologist's answers to 27 questions on the patient's personality, her description of his character and her assessment of his intelligence were checked by the patient's own answers to the questionnaire, by the personality descriptions in the case-sheets, and by the results of the Progressive Matrices Test.

In the different forms of neurosis and psychopathy the handwriting shows a characteristic combination of specific features, which the graphologist can recognize. In no case was the graphologist's description discrepant with the existing neurosis. In some cases it was found to be striking at a deeper level than that of conscious behaviour. When the handwriting does not reflect the neurosis it may be because the deeper layers of the personality are not yet affected by the disorder. Though the graphologist may not be able in some cases to detect a surface symptom, he may nevertheless point to the psychological explanation of it at a deeper level.

The graphological assessment of personality traits has been discussed in respect of emotionality or calmness, intelligence, the attitude towards the self, towards other people and towards work. Those features which are closely related to the neurosis, such as emotionality, self-centredness, lack of self-confidence, impaired sociability and conscientiousness, were found to have been recognized in the handwriting in consonance with the psychiatrist's reports and the patient's own account of himself in more than two-thirds of the cases. Other traits, such as inner conflict, sociability, dependence, initiative at work and the lack of it, concentration and responsibility were similarly detected by the graphologist and confirmed. Distractibility was twice as often mentioned by the patients as by the graphologist.

The graphological analysis was not restricted to these traits, but those which could not be checked by the methods described in this paper have been omitted.

There was no satisfactory correlation between the graphological assessment of the patient's intelligence and that arrived at by the Progressive Matrices Test. One of the reasons for this was that the graphologist overrated one specific trait in the handwriting, indicating an impairment of intelligence. A comparison with the school records of the patients showed, however, that the graphological estimates of intelligence, which were higher than the Matrices Test results, corresponded more closely to the school records than did the test results. Since it is possible that achievement on the Matrices Test are not always indicative of the actual intelligence of neurotics,* the graphological assessments of intelligence ought to be checked on a different group of subjects before deciding their validity in this respect.

Conclusion.

The checking of graphological analyses reported in this paper represents an attempt to provide a more scientific basis for the practice of graphology. More statistical evidence, as well as different methods of checking with different sets of individuals, are still needed. Moreover, as Stein-Lewinson and Zubin have demonstrated,† measurement of the graphic symptoms can be rendered more precise. Research on the handwriting of twins,‡ the individual development of handwriting from childhood onwards,§ and the handwriting of outstanding personalities, pathological as well as normal,|| can also contribute towards yielding scientifically acceptable graphological results. The present writer hopes to have shown that graphology can be a useful method of recognizing character, and that it is complementary to the other methods at our disposal. Ultimately, any theoretical and practical approach to human character is based on understanding; it cannot be wholly rational. It would, therefore, also be erroneous to assume that graphology could be entirely reduced to the measurement of stated single symptoms or groups of symptoms in the handwriting. But the more graphology progresses on scientific lines, the more can the factor of subjectivity be restricted.¶

* *Cf.* Babcock, No. 74.

† *Cf.* Bibliography No. 44 (Stein-Lewinson and Zubin).

‡ *Cf.* Bibliography Nos. 27 and 47 (Hartge, M.) (Lottig, H.).

§ *Cf.* Bibliography No. 68 (Wenzl, A.).

|| *Cf.* Bibliography No. 61 (Rose and Mannheim).

¶ It would be a step forward on this way if specimens of each patient's handwriting were added to the case-sheets.

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The author wishes to express her sincere thanks to Mill Hill Emergency Hospital, and Dr. H. J. Eysenck, who called forth this investigation and provided the material for it.

QUESTIONNAIRE.

1. Are you more interested in sports or in intellectual things ?
2. Do you particularly dislike being bossed, or do you generally do as you are told, without feeling rebellious ?
3. Do you usually " kick up hell " when you are not getting a square deal, or do you usually just shrug your shoulders and say, " Oh, it doesn't matter ? "
4. Do you enjoy being in a position where you can give orders, or do you dislike having such responsibility ?
5. Do you consider yourself a happy-go-lucky individual, or are you inclined to worry over possible misfortunes ?
6. Are you inclined to stop and think things over before acting, or do you often act on impulse ?
7. Are you inclined to ponder over your past, or do you rather live for the day ?
8. Are you rather over-conscientious in your work, or do you tend to be a bit slap-dash ?
9. Are you inclined to try and watch your own mind at work and analyse your motives for doing things, or do you consider that sort of thing rather morbid ?
10. Do you enjoy thinking out complicated problems, such as crossword puzzles, etc., or do you consider such things highbrow ?
11. Do you adapt yourself easily to new conditions, or do you take some time to settle down ?
12. Do you get rattled easily in exciting situations, examinations or manoeuvres for instance, or do you usually remain calm, cool and collected ?
13. Do you often have feelings of inferiority, or do you usually feel self-confident ?
14. Are you often troubled by feelings of self-consciousness, or do you go along happily without bothering much about what others will think of you ?
15. When you are working are you easily distracted by things that are happening around you, or do you usually concentrate whole-heartedly on your work ?
16. When you are sitting or lying down can you usually relax easily, or do you remain tense for a long time ?
17. When something unexpected happens are you easily startled, or do you remain quite unaffected ?
18. Do you often sleep badly, or would you call yourself a fairly sound sleeper ?
19. Would you consider yourself quick and agile in your actions, or are you rather slow but sure ?
20. Do you often rush from one activity to another without pausing for a rest, or do you prefer having a bit of a rest before starting on anything new ?
21. Do you like to talk a lot, or do you let the others do the talking ?
22. Do you like meeting new people, or does the prospect of doing so rather upset you ?
23. When you and your friends are doing something, do you usually take the lead, or do you fall in with other peoples' wishes ?
24. Do you have frequent ups and downs in mood, or do you go along on an even keel ?
25. Are your feelings easily hurt, or do you tend to remain unruffled in general ?
26. Do you tend to express such emotions as delight, sorrow, anger, etc., readily, or do you feel that it would never do to exhibit your emotions publicly ?
27. When you are out with friends, do you enter into the fun whole-heartedly, or do you tend to be rather quiet and withdrawn ?
28. Would you like to go through thrilling experiences and adventures yourself, or do you prefer reading about them and seeing them at the pictures ?

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AN ACCOUNT OF LOWENFELD TECHNIQUE IN A CHILD GUIDANCE CLINIC, WITH A SURVEY OF THERAPEUTIC PLAY TECHNIQUE IN GREAT BRITAIN AND U.S.A.

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INTRODUCTORY.

THE following paper is a description of a form of direct psycho-therapy with children undertaken in a Child Guidance Clinic, and some account of the results achieved in certain cases.

Although direct methods are comparatively little used in this country, they have reached considerable development in America, and the paper closes with a review of the literature dealing with this subject in England and America.

In September, 1937, Dr. C. L. C. Burns, Director of the Birmingham Child Guidance Clinic, desiring a practical demonstration of Play Therapy on the lines devised by Dr. Margaret Lowenfeld, started, with the kind permission of the Birmingham Education Committee, a nine months' demonstration period. This paper is the outcome of that work. The writer would like to express her thanks for the kindness she received from all the staff of the clinic; every facility was given her to make the demonstration a success.

PRINCIPLES ON WHICH THE WRITER'S WORK WAS BASED.

1. *Function of Play Used as a Therapeutic Instrument.*

(1) It is natural for a child to express himself through the medium of play for the following reasons:

(*a*) The child has little facility in the use of words. It is not as a rule until puberty is reached that the spoken language becomes the most useful means of self-expression. In dealing with the younger child another language must be found, and this is provided by the child's spontaneous play activities.

(*b*) The ideas and feelings which the child needs to express are often almost impossible to put into words. Even adults have great difficulty in doing so unless they have an unusual command of language. Indeed, metaphor and analogy, which are a form of "picture" language, are an essential part of ordinary conversation.

(*c*) In a healthy and happy child a continuous flow of impulse, idea, ambition and feeling expresses itself directly in successive acts of play. These activities follow one another according to the changing impulses in the child, and for the most part without the intervention of much conscious consideration. Such play is a complex phenomenon made up of many elements, such as pure bodily experience, experiment with material, endeavour to understand the environment and experiment with it, the acquirement of skill and of emotional expression. All these form an inter-relating system. Dr. Lowenfeld has suggested that this form of thought might be called the "primary system." This form of thought is personal, multidimensional, irrational, and largely unrelated to objective external fact. Side by side with this there develops the individual's objective relationship to the outside world. The instrument of this relationship is speech. The world of speech, whether interior or exterior, and which Dr. Lowenfeld has suggested might be called the "secondary system," is synonymous with what is usually called the conscious or cognitive aspect of the mind. It is logical and lineal in structure, as opposed to the multi-dimensional nature of the primary system. The "primary"

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system does not cease with the appearance of the " secondary " system, but remains active throughout life, appearing to form the matrix of what is called by other schools of thought the unconscious, and thus closely allied to the basic human drives. The contents of the " primary system " cannot be expressed in ordinary prose, and can only adequately be represented by means of material such as is provided by play, bodily activities or through the arts. It has long been recognized by all schools of psychotherapy, especially that of Jung, that certain aspects of experience can generally be represented better in pictures than in words. The richness of a child's primary world and his lack of skill make the use of drawing as a means of communication, good as it is, of very limited application. The peculiar multi-dimensional character of a child's inner experience can only be rendered with difficulty by this means. It was in the process of attempting to bridge this gap that Dr. Lowenfeld's " world apparatus " and other play material were designed. This apparatus, because of its three-dimensional qualities, the varieties of its mode of use, and the opportunity it gives of representing movement, supplies the child with a means of directly depicting his interior experience. It is not every child, of course, who will find the world apparatus the easiest medium of expression, but the great majority make extensive use of it.

(*d*) The child who comes for treatment has many feelings and ideas he does not wish to face or to express, but through play he can release and work through feelings which have never found a proper outlet. Through such play and the gaining of legitimate satisfaction these desires can become integrated with the personality. Examples of such play are mess, noise and aggression. Alternatively the restless child, through understanding and reassurance, can gain such security in the playroom as will enable him to learn the satisfactions of constructive work and consecutive thought.

(2) During the final stage in the playroom the energy which has been released and integrated into the personality is led into constructive outlets in the external world of feeling, action and thought.

2. *Role of Therapist.*

In this technique the role of therapist is in many ways different from that practised in the carrying out of other techniques. The relationship of the playroom worker to the child does not fall into any category described in the literature already given, but is a development of that described in Dr. Lowenfeld's paper of 1931. To be used effectively it needs considerable experience and grasp of the different relationships that are possible in such a situation. It is very rare that the therapist takes on to the child the character of an actual individual in the child's environment.

(1) In this method the playroom worker, as in other techniques, remains as far as possible neutral. She is part of the playroom equipment, an outside observer joining in the play when required to, and explaining to the child his ideas as they are unfolded. There is, however, a significant difference in that every attempt is made to obviate the development of a specific relationship between the child and the therapist. This has the great advantage that it permits of a change of worker at any point in the course of treatment without disturbance either to the child or to the therapeutic process. The records which follow will illustrate this. Nevertheless it does happen in certain cases, just as in the ordinary play at a children's party, that the worker may be called upon to assume roles of any kind in the child's particular bit of play, such as the unpleasant girl next door or the severe teacher. It also occasionally happens that a child will ally himself with one particular worker : for example, a child newly arrived from South Africa felt homesick ; she allied herself with a worker who was also from South Africa, and together they abused us all in Afrikaans.

(2) On arrival the therapist gives the child an explanation of why he has come to play. The child is then told that thought, feeling and experience can take the form of pictures which build themselves into a language but do not use words. Finally that the clinic in which he finds himself is a place whose purpose is to enable him to set out and come to understand any problems with which he is concerned. Here arises a point of great importance about which there has been a good deal of confusion. It is not the mere provision of material or even a safe

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place in which to use it, at any rate with children over the age of six to eight years, that necessarily results in the expression of the primary system. It is necessary to build bridges between such fragments of the primary system as appear and the secondary system. (A similar point has been discussed by Margaret Gerrard in the publications listed at the end of this paper.) A strict parallel here exists between ordinary conversation, and the conversation of an adult with a friend or adviser to whom he has gone in order to discuss specific and definite problems of his own. It is for this reason that it is unwise to mix forms of play such as educational or socializing play and play used for therapeutic purposes.

(3) In the child who comes to the clinic for treatment, the primary system content is so incoherent and confused, and has often become so incompatible with external reality and inconsistent with the child's later feelings and ideas, that a situation has developed which is difficult to describe. Whatever name is given to this part of the mind, all workers are agreed that it is charged with dynamic energy. Where the content of the primary system is sufficiently in line with what the child's environment conceives to be the nature of reality, the energy infusing the primary system can to some extent discharge itself directly along channels already made for it by the environment. For example, at the moment, thanks to Hitler, the child has a legitimate outlet for the most bloodthirsty feelings, the expressions of which are approved by the community. If, on the other hand, no such channels exist, then something seems to take place which is akin to our spontaneous use of physical experiences as symbols of emotional states (as, for example, the expression, " I am sick of such and such ") ; that is, the energy discharges itself in an allied path such as educational failure, antisocial behaviour, physical states, etc. For improvement to take place these primary system concepts must be brought into line with reality and integrated with the total self. This process is brought about in the method to be described by two activities taking place simultaneously. These are, the expression of the primary system content by the child through play, and the relating of these to the secondary system by the action of the therapist who intervenes with explanations, making the child aware of what he is doing and explaining to him in terms he can understand. The degree of detail and the type of explanation given by the therapist of any individual piece of play will depend necessarily upon the age, education, and temperament of the patient, and the stage which has been reached in the process of treatment. The following is a general summary of the usual steps taken.

(*a*) At first it is the general structure and salient features of a child's " pictures " (expressed through whatever medium he chooses) to which his attention is drawn ; for example, that he always includes water in his paintings, or that none of his fields have gates in them.

(*b*) Next, the exact meaning to the child of the objects in his play is determined. Thus in his " world " men and women may be just people to him or they may have individual significance ; wild animals may be tame or vice versa ; a pond may be just a pond, or, as in one case, poisonous red dye. It must be further ascertained whether the " world " is static or in movement ; for example, soldiers which look the same may be just ready for action or in the act of charging.

(*c*) The main obvious content of his play is then pointed out to the child—for example, that his worlds are fear worlds—but no interpretation is given which presupposes a knowledge in the worker which the child does not share.

(*d*) The relation of any one world to any previous world and to any other kind of work, such as paintings, is traced out with the child. He is thus enabled to see his work as a sequence of primary thought.

(*e*) More detailed explanation of the child's particular problems follows.

It is obvious that any worker with experience will often see a great deal more in a child's play than the ground so far covered with him has revealed, and it is upon his capacity to do so that the thoroughness of his work depends. In time the child must come to appreciate the contents of his own " primary system." This is a gradual process ; the worker's part is to use his greater knowledge and experience to point out to the child such facts about each piece of play as can *immediately be assimilated* by the child.

At this point it is worth noting that the technique deviates from that usually described for deep therapy, where interpretation is given at a point where there is no possibility of its being intellectually understood—that is, incorporated into the

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child's " secondary system." The more gradual use of explanation in the procedure here set out may account for the fact that little resistance is usually met with.

It is here worth noting that the whole of the procedure described has evolved in the actual work of psycho-therapy. At the time when the Institute of Child Psychology was founded, and for several years after, very little explanation was given to the child, as can be seen in the account given by Dr. Lowenfeld in 1931. As time passed, with increasing experience it was found possible cautiously to enlarge the amount of explanation given, the material for such explanation being drawn from increasing understanding of what is now called the " primary system," and continually retested on fresh cases. Parallel with cases where explanation was given, to certain cases no explanation was given, and it was found that although in some highly specialized instances an improvement occurred, yet the scope was limited and the success only partial. It is on the whole, since the development of a definite and specific technique in the use of " worlds " and other play material, that there has been lasting success with the children.

It is perhaps worth noting that in this method stress is laid on the child learning to deal with himself and his environment rather than upon bringing about a change in his environment—a procedure which is often difficult and may be wellnigh impossible. An interesting fact that has often been found is that as the child improves so the parents' attitude changes. This is the moment when the parent can be most easily and effectively helped to alter his or her way of dealing with the child. Often the parents themselves will realize that they have been to blame and will admit this spontaneously.

In addition it is often impossible to tell in what way the parents' attitude should be changed until this has been learnt from the child himself.

Routine Technical Procedure.

All children concerned in the experiment under description attended elementary schools. They came to the clinic twice a week for an hour, and generally after the first interview, except for the younger children, who were brought by their parents, came alone.

While in the playroom each child was, on the whole, allowed unrestricted choice of material, though occasionally a particular type of activity would be asked for by the therapist. The only rules were that the child should not damage himself, other children or clinic property. No notes were taken within the observation of the child, although all the children knew that records were kept of worlds and mosaics.

Out of the available material five cases have been selected to show the working out of the technique. In two of these cases intelligence was above the average, and in the remaining three the I.Q. varied between 78 and 85.

The first three cases show children working out ideas and desires relative to their own bodies and other people, and gaining a sane perspective in relation to them.

The following are studies of five cases referred to the Birmingham Child Guidance Clinic illustrating this method.

Sphere of Work.

The clinic was housed in its own premises and consisted of the following rooms: On the ground floor was an office, a waiting room and two playrooms; outside was a yard and a small garden. On the first floor were the rooms of the Director, Social Worker and Psychologist, and a playroom out of which opened a bathroom. The ground floor playroom was used for noisy and messy play, and the smaller one for water play. The upper playroom was used for play not involving noise or mess. The bathroom could only be used for very quiet water play, as the floor did not admit of being wet.

The equipment of the playrooms consisted of the following materials: a small house in which children could play; this contained a table and chairs, a camp bed and a rug. A box of mosaics, two sand trays and a little world material. Excellent painting material, pencils, crayons and plasticine, meccano, and the remains of construction toys. A doll's house, dolls, Russian dolls, brush and pan. Bricks, puzzles, paste, scissors, basins, jugs, jars, acting clothes.

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To these were added many more world toys, doll's household utensils, glitter wax, flour, a Russian pyramid, babies' bottle, hammer, pegs, skittles, cheap carpentry tools, packing cases, carpentry bench, mincing machine, letters of the alphabet. Water toys, such as squirts, tubes, floating toys, boats. Construction material, Bayko, Minibrix, Pica brix, aeroplane construction, sewing cards, leatherwork, ball mosaics, peg pictures, hammering, Figuba and Krazy Ike.

The Play Therapy department was an integral part of the clinic organization, being in charge of the writer, who had assistance from students attending the playroom sessions. Some of the children were also given treatment by a trained pupil of Matthias Alexander. The educational coaching and testing were done by Miss Dove. All the children were under the care of the Medical Director, Dr. C. L. C. Burns, to whose co-operation and courtesy the publication of the present paper is due. In addition to these staff, the social side of the work was in the charge of a psychiatric social worker, while a parents' physician helped with the parents' difficulties when possible.

The general organization of the work in relation to each individual child was as follows: The clinic was open to children every weekday; the hours of treatment were from 9 or 10 to 12, and from 2 to 6. Every day there was a group of children, eight to ten children attended the groups, and it was found to be more satisfactory to divide the groups into two, so that four or five attended for one hour instead of eight to ten children for two hours. Except at the beginning and end of term, there was always one student to help with the groups.

The play of each child was recorded every day, and copies of mosaics, worlds, drawings and newspaper games were kept.

New children and their parents were interviewed during play group sessions and the children came into the playroom and did mosaics and drawings. On the first day the Social Worker obtained a history of the child and the family. On the second day they were interviewed by the Medical Director, and on a third day the child was given an intelligence test, after which the decision about the child was taken. Every other Saturday the staff met to discuss the new children, and there were daily discussions whenever necessary.

Some form of play has always been an element in this clinic. Four months before the work recorded in this paper began the clinic had moved to new premises, and the children had been attending play groups which were in charge of the Social Worker, eight to ten children forming a group.

In September, 1937, with the co-operation of the Institute of Child Psychology, a nine months' demonstration of the method of Play Therapy devised by Margaret Lowenfeld was undertaken by the writer, at the request of the Medical Director.

A mosaic was done by every child who attended the clinic. It is an undifferentiated, unspecific test devised by Margaret Lowenfeld to test emotional stability and temperament. It consists of flat pieces of wood in five shapes—square, diamond, isosceles, equilateral and right-angled triangles. Each shape is made in six colours—black, white, red, green, yellow and blue. The child is shown the material and told to make anything he likes in the tray provided for the purpose. Beyond this there are no restrictions.

Case Studies.

The following are studies of five of these children referred respectively for (1) Arson; (2) fear of school; (3) tic, and fear of doctors and dentists; (4) hysterical paralysis; (5) inability to read.

The first case is a clear example of the difficulties of the parent-child relationship, the emphasis being on the relationship to the mother. The next case is an example of the same difficulty, the emphasis on the father. The two form a striking contrast.

The Case of Alfred W—.

Alfred, aged 9½, was referred by the Probation Officer for arson and factory breaking. In August, 1937, he was charged with attempting to set fire to a church. Some time previous to this he had been charged, along with several other boys, for factory breaking; it was then discovered that at Christmas, 1935, he had set fire to the crib in the same church.

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Family background.—The parents were of very different temperaments, and disagreed over the upbringing of Alfred. The father, a canal worker, was a delicate, asthmatic, rather feeble man, who spoilt Alfred. The mother seemed to have common sense, though she was easily upset and " became all of a tremble." The parents, for many years during Alfred's early life, though living in the same house, were separated from each other, during which time Alfred slept with his father, but latterly the parents had come together again.

Alfred was the youngest of a large family; the others were all over twenty. One sister had been married and was separated from her husband, and returning home had brought with her a son aged 7. When the parents began to occupy the same bedroom Alfred slept with his sister and nephew. His older brothers and sisters alternately spoiled and corrected him. The family lived in a very noisy district, but the house itself was clean and comfortable.

Patient.—He was an unwelcome addition to the family and definitely unwanted by his mother, though she said that she had since become reconciled to him. He was not breast-fed; otherwise his development was normal. His mother described him as delicate, and over-clothed him considerably. At six he had whooping-cough and pneumonia. He was always a very bad colour in the morning.

In temperament he was described as solitary; he used to sit a long time in thought. He loved dressing up in his mother's clothes; went to church three times on Sundays and every day to pray by himself.

School report.—He was below the average, easy to manage, friendly, but not a good mixer, as he soon tired of any game. He was timid, underhand and untruthful, and would torment anyone sitting next to him.

Intelligence test.—His I.Q. was 85. The psychologist remarked that he was pale, drawn and tense, and looked miserable. He was quiet, timid, and had little to say; he seemed thoroughly dull and lacking in initiative, self-confidence and vitality.

Treatment.—He made 38 attendances over a period of six months. He was taken partly in the group and partly individually.

For the first session he was very quiet and timid, but by the second session he had begun to change. His play is exceedingly interesting; many themes are interwoven in a fantastic manner, only a few of which were touched on in the explanations which were given to him. The most striking features revealed in his play were the extreme ambivalence of his emotional life, and his attempt to understand the various sides of life by himself acting different characters in turn.

His mosaic was a largish star pattern, unsuccessful in one corner and giving a very spiky effect; the whole indicated the presence of a good deal of aggression.

On his first attendance he made the following drawing:

31.viii.37: He drew a grotesque face with one enormous ear; the other ear had been cut off. Fireworks were going off all round the face, and one was about to go through his neck. He then drew a smaller face with both ears off, the tongue hanging out and fireworks attacking the face. The face was called Tommy Brown—an imaginary person.

It was then explained to him what kind of place the clinic was and why he came and played. He admitted that he had set fire to the altar on Christmas Day; he had found the matches on a statue; he had seen someone put them there. He said that he did not like doing it, but felt he had to. These kinds of feelings were discussed, and a pleased grin came on his face when the worker remarked that it might have been more fun to burn Tommy Brown really.

The next time he came he did a world which consisted of wild animals loosely dotted about the tray. He built solid structures with big bricks and knocked them down, always going for the foundations; this was pointed out to him. He drew ugly faces and dressed up as Mae West, in which guise he had a boxing match with another boy.

Thus from the start he showed that under all his timidity were hidden strong, aggressive feelings.

7.ix.37 (play with Voluntary Helper): He began by knocking down brick structures. Next he dressed up as an Arab Chief and joined a group in the garden. They were making a fire. He was apprehensive about this, in case it was not allowed. Then, beating a tin and making queer antics, he started a ritualistic dance round the fire, later using his hands as if in prayer.

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He chose a tree for a god, and, bowing low, called it Allah. He helped to make dough cakes, which were stuck on the ends of sticks; his cake became a man whom he ate. He demanded that "he" be roasted over the fire; then he led a dance with flaming torches. A worker appeared; she was immediately captured and tied to a tree while he tried to brand her with a burning stick. When she was freed she was told she was quite safe and could not be recaptured.

The writer questioned him about his play, and he said that if people do not bow down to the god they get killed; they have to sign a book when they bow so that the others shall know whether they have done so or not. The people who were roasted were pirates, and pirates are people who catch you and make you work.

It now seemed clear that it was the aggressive aspect of fire which interested him. His aggression was directed against authority, who also had to be propitiated. This would account for the fact that he went frequently to church to pray and yet tried to destroy the church. His idea of authority contains two conceptions—the bad pirates who make you work and a god to whom you pray for things, and one of the things you pray for is forgiveness.

9.ix.37: He did a world in which soldiers in a field with an open gate were being attacked by Indians for their gold. A log was an Arab god that the Indians had knocked down.

14.ix.37: He played by himself in the little house, decorating it according to his liking. He drew a picture for the walls, which consisted of a house, a church with an enormous spire and a blacksmith's forge, where a horseshoe was being made. The people in the picture wore long pointed hats.

Next he drank some wine, found that all his money had gone and caught the burglar; he tied him to a chair and tortured him, only to find that he had not got the money.

He said that some toilet paper was money; he put it under the hot tap and said that was how you made money. (Unfortunately he was with an untrained worker and this piece of play was not taken up with him.) He returned to the house and talked a great deal about the baby and how it had just arrived. He kept on having burglar scares, against whom the doors and windows had to be barricaded.

His drawing contained obvious phallic symbols; this, combined with his talk about a baby who had just arrived, indicated the need for sex instruction; this was accordingly given during the next few sessions.

It is agreed by all schools of thought that neurosis arises out of persistence in later life, in some form or other, of wishes and ideas from earlier times which are inappropriate to the present age. Many schools of thought feel that the expression of these wishes, through the overcoming of resistance to them, and the interpretation to the child of their nature are all that is necessary without any explanation being given to the child as to how this curious state of affairs comes about. According to the technique with which these children were treated, the whole conception is based on the bridging of the gulf between the primary and secondary forms of thought and the assimilation into the child's awareness of the total phenomenon of the mind. (The word "total" is here not used in its literal sense, but pictorially.) It is therefore necessary at this stage in a child's treatment that an explanation be given to the child of the way in which his difficulties have come about. In the technique here employed this is done by means of a diagram. In the diagram three things are explained:

(*a*) The way in which two desires of a child may come into conflict with each other, thus blocking the expression of one.

(*b*) The way in which a wish or desire may become turned into its opposite.

(*c*) The way in which a wish denied outlet can find for itself a disguised expression.

To return to the case. At this point he was given the "wishes diagram." His wish was for a baby's dummy.

15.ix.37: He acted the part of the mother in the house and was also the milkman. He said that it was raining hard, so we had to beware of burglars. Then he darkened the room and blackened his face; then he himself became a burglar stealing chairs—actually he took clothes; he was very afraid while he was stealing, acting his fear realistically, even to the heavy breathing.

The next time he became mother again. He also talked about the misdeeds of his sister. He said he was lonely at home; the children in the streets did not want to play with him.

21.ix.37 (Voluntary Helper): He became the irate father, for whom nothing was right. He dressed up as a bride. He had storms in the water, in which ships were wrecked and ducks were drowned. He dressed up, saying he was an old man, but he looked like a woman; he threw the newborn baby down the stairs; was aggressive to a worker, saying he hated her. He played with water, tying boats together in the docks.

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On this day (21.ix.37) sex instruction given was finished. His attention was drawn to the different ways in which he had been aggressive, burning people, throwing bricks at houses, drawing ugly faces, boxing, being a burglar, drowning ducks and wrecking ships. With most of these children, and specially with a child of low intelligence such as this boy, it is no use saying too much at one time, so the worker did not say any more on this day.

23.ix.37 (Voluntary Helper): A worker was mother, and Alfred and she went to buy Christmas presents for the baby girl. His choice was a toy theatre. He himself then played with this, setting up scenes and looking at the effect; he set up alternately country and castle scenes; he never got to the point of actually acting out the scenes.

28.ix.37: He dressed as a bride and then as a bridegroom. He arranged the scenes in the toy theatre, sewed cards, made storms in the water, then paddled about in it happily.

For the next two and a half months he continually set up the theatre but never actually got to the point of acting a play; he was too restless and dissatisfied; he never got further than being about to act a play.

The next day the content of the last three sessions was gone over with him; he was shown how he was playing out different roles; he was mother and father, a bride and bridegroom, Arab chief, and Mae West, a milkman and a burglar; he played out the roles of both men and women. It was pointed out that when he was mother he was being burgled, but when he acted the burglar he was himself—it was Alfred doing the stealing, so that it seemed that he wanted to rob mother of something; there was something he wanted from her. He was reminded of the "wishes diagram," and that his wish was for a dummy; he agreed that he would like to be a baby.

He built a castle and knocked it down vigorously, the point being to get inside. The idea was put to him that the castle stood for something else, something inside of which he wanted to get. He agreed and went straight to the tube on the tap and squirted, saying "psss." The similarity between the tube and his penis was pointed out; he agreed it was so and pretended to put out a fire with it. So we came to the conclusion that this desire to attack had something to do with his penis wanting to get inside, and is related to fire.

30.ix.37 (Voluntary Worker): While making dough he told stories about imaginary brothers and sisters, who kick him if he does not do as they want. He toyed with the theatre, became a Jack-in-the-box, threw clothes aggressively at his worker and demonstrated how he made his imaginary brother eat dough.

5.x.37: He dressed as a woman of 91 and sucked the baby's bottle; this was likened to the dummy that he wanted. He helped to make a fire. When it was time to go he went into the little house, lay down under the rug on the bed and refused to go home. He said that his parents would not care if he did not go home; they would never notice. He looked tearful. The worker sat by him while he lay comfortably for a while; she then left him in order to tidy the room, and he went home after a while.

As this feeling was based on reality, since as a baby he was not wanted, the appropriate course of action was to treat it as a reality, sympathizing and waiting for developments.

6.x.37: He built a tall house with bricks and knocked it down; then squirted with the tube. He was reminded that we had to find out what this brick house was; he then ran upstairs and brought down paint. He mixed all the colours together and made an ugly brown mess, which he said was poison, to poison a lot of women—when they put the dishcloth on it it would explode. He started squirting and turned the tube on the worker.

The above play was taken up with him. We talked about women and what a lot there were in his house telling him what to do; he agreed to this heartily. He was sympathized with and the worker said that he must feel angry with them; sometimes it would be nice just to poison them.

7.x.37: He made "poisonous" cakes. He fiddled with the theatre and became over-excited paddling in the bath.

11.x.37: By himself he knocked down brick houses. He went into the little house and said there would be no more murders to-day—he was being mother. It was put to him that he felt

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safer as mother and did not need to murder. He said that he had a baby. He made a world of four cross-roads, three of which were culs-de-sac. There were houses, women shopping, traffic, and someone waiting for the tram.

It was pointed out that the roads went nowhere.

It seemed clear now that he felt very ambivalent towards his mother; accordingly ambivalent feelings were discussed. It was pointed out that sometimes he wanted to poison women, and at others he wanted to get so close to mother that he wanted to get right inside her and even become her. He was assured that everybody had ambivalent feelings at times. The following day this ambivalence was again shown.

18.x.37: He knocked down a brick house which he called by the name of his family. It was pointed out that the church which he had wanted to burn was a building like a house. He went to the tube and squirted, saying he would put out the fire. He covered the figure of a policeman with sticky paste and melted glitter wax.

21.x.37: He made a brick structure, which he knocked down in order to get at the cars inside. He made a rough table out of wood, then broke it up; he said he would go upstairs to drown himself. He enjoyed standing in hot water. He hurt his (voluntary) worker by putting her hand under the hot tap; he agreed that he liked hurting people. He covered his head with lather and enjoyed having it dried by the fire, where his worker was motherly to him.

From now on he ceased to be merely destructive and aggressive and began to be constructive, while his worlds became more coherent and detailed.

25.x.37: He enjoyed the feel of glitter wax, did some hammering, attempted to mend shoes, but only succeeded in pulling them to bits. He sharpened pencils, and said he was washing them because they became clean. Broken pencils went into the sharpener without heads and came out with one. He made a world with roads which were carefully made to the edge of the tray because "they had to go somewhere." In the centre of the top of the tray he had soldiers and tents, one for the king and one for the servants and a safe for stores. There are houses, one of which is on fire. People are waiting for the tram, which is held up by a car being filled with petrol. On the right was a fenced pond, over which was a bridge; a milkmaid was coming along the path.

8.xi.37: He made a world of a zoo in which the wild animals were fenced; there were flowers dotted about, and paths in the form of a cross for people to stand on.

This world was very carefully made and took over an hour. It is interesting to compare this world with his first one. In the latter the wild animals were loosely dotted about; it was rapidly and carelessly made and contained no ordered idea. The last world seems to show that he has more control over his hitherto uncontrollable feelings of aggression, but the house on fire of his previous world indicates that this control is not yet complete.

11.xi.37: He spent some time sucking the baby's bottle with great enjoyment.

15.xi.37: He played with wet sand; he built a strong wall across the tray and put water on either side; he attempted to make a tunnel, then smashed the whole. He buried a jug full of sand—he said that this served it right for telling lies; the little jug poured water on it. The big jug was hit for telling lies—it had said the little jug was cheeky and really it was the big one that had been. He put some string inside the Russian doll and said it was his secret; he heard men's footsteps outside and ran away, saying it was a ghost.

29.xi.37: He made a table for a conjuring trick; it had a round hole in the middle, out of which popped rabbits. He was reminded of how babies are born; the rabbit popping out of the hole was like a rabbit being born. He made a world of a farm very carefully; on one side was a ploughed field, and on the right a farm yard containing animals, a pond and women washing.

2.xii.37: He touched on his old occupation of dressing up and water play, then decided to do carpentry.

6.xii.37 (Voluntary Helper): He went on with his carpentry; then he set up the theatre and, for the first time, actually acted a scene of soldiers on parade in the castle. He did the same next time he came.

13.xii.37: He said he played in the street now and only sometimes dressed up; he was going to be a carpenter when he grew up. He was given the "wishes diagram" again; he wished for a titty bottle and a rattle, to break things and to play with mother's toes. As he had lately been looking into things and hiding, etc., therefore worker gave the wish to look behind the curtains and into things one must not look at; he agreed to this. We went over sex instruction; he had forgotten quite a lot, and said that babies grew inside mother's heart from a bit of food; it took him some time to work it out, but he did in the end. He remembered the physiology quite well.

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He made a world of a village in which was a fair with a switchback railway.

During the next two sessions he got inside things and barricaded himself in a room with another child. He did carpentry, and talked a great deal about a magic lantern he was going to get for Christmas. He made a complicated mosaic which was not entirely successful; it was a hexagon pattern with rectangles at the sides.

The holidays now intervened. At the beginning of the term he came back, looking rosy and lively; the dark rings under his eyes had gone.

10.i.38: He covered over the little house with a rug and stayed inside until it was nearly time to go; he hastily came out because he said he wanted to make a world; he would take down the cover of the house before he went home; this last was welcomed. The world was a desert, camels got caught in a sand-storm and could not breathe; they were buried, then dug out. The camels came to a rock, which was the "Queen's Parlour" (this is actually a rock near his aunt's); over the cave the camels are once more buried and they die; they are dug out and given air and are all right. Once more they went into the cave. Worker remarked that it was much nicer outside caves and cosy places like houses roofed over; it was nice to get out and grow up and do all kinds of things; it got stuffy in these little places.

He got a jug of water, which was thrown down violently because it had lain about wetting the sand. He made a world of roads and houses. There was a pond of water surrounded by fences and gates. All this was welcomed by worker.

13.i.38 (Voluntary Helper): He set up the theatre and made a scene which was an attack on Dudley Castle; black and white soldiers were fighting outside. The next scene was the castle without soldiers and the final scene was of the quiet country. The play was purposeful, and seemed very satisfying to him.

He now seemed to be definitely leaving behind the desire to be a baby and to remain curled up in a cosy place. For the next four sessions he joined other boys at various pieces of play and co-operated well, he was very lively and full of ideas. He also touched on the various themes of his past play, and worker reminded him of the explanations which had been given.

14.iii.38: He made a mosaic of two simple patterns, which were successful and not over ambitious for his intellectual level. He also made a world of a farm with pigs eating; two women were returning from market by crossing the river in a boat. A house on fire had a ladder against it. The animals were frightened and were running away, except for the pigs, who continued eating. Women in carts were ready to go.

He rigged up the theatre very ingeniously and gave a performance to an audience. The play was a noisy piece of burlesque: an elephant with a long nose was hitting someone; a woman had lost a dog; the elephant had killed someone and was trying to get out of it.

He played blind man's buff, co-operating well.

28.iii.38: He played with the others at various games and dressed up as the vicar.

His behaviour in the playroom was now that of a very normal, lively little boy, able to hold his own in a group and to take initiative. He organized the public performance of his play very well, even down to the seats which each member of the audience had to occupy. The performance of his play was a good step forward in his development; the production of plays now gave him a creative outlet for his aggressive feelings.

He was not now giving any trouble at home. His history of his outward behaviour was as follows: After the upset caused by his appearance at Court he was forbidden to go to church; he remained an isolated, difficult and moody child. Since about the middle of treatment he expressed no desire to go to church.

His isolation began gradually to disappear, and on 13.xii.37 he stated that he was now playing in the street. The school reported improvement in his general attitude. The whole boy's outward self had changed; his colour had greatly improved, he looked well, and his face had a bright and eager expression. Although there were signs in his play that anxiety was not entirely resolved, yet owing to the pressure on space in the clinic and as all outward signs of disturbance had disappeared he was discharged.

The Case of Ronald B—.

Ronald, aged 12½ at the time of this treatment, was referred on 1.xii.35 for being too nervous to attend school. After he had been two weeks in a senior school he ran away from the manual class. There was no apparent reason for this, as the master was a kind man.

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Family history.—When the mother first came to the clinic she made no mention of any ill-health or of nervous instability in the family. All she reported about the father, a canal worker, was that he had to control himself in order not to give Ronald a thrashing when he answered his father back. It was not until May, 1938, that the mother admitted that the father was a drunkard who was violent when drunk and had once tried to gas himself, and that his brother had cut his throat.

His mother was very attached to Ronald and liked to keep him by her. She had given up as hopeless the struggle with her difficulties and had accepted life with her husband resignedly.

Patient's history.—Ronald was the youngest of ten siblings, born five years after the ninth child. He was breast fed for eighteen months and developed normally. He slept in his parents' room until he was 5. For the last two years he had returned to the parents' room owing to his bad nights. During these he used to scream out, " Mum, look how big my hands are."

School reported that he was a normal boy in every way and they could not understand why he had run away.

Child himself.—On admission (1.xii.36) the Medical Director reported him to be a pale, rather soft-looking boy, and left-handed. He felt very inferior to the rest of the family ; he did not like school, but could give no reason except that the boys were too rough. At home he had plenty of determination and concentration, but at times he seemed to be miles away. He got headaches when he read for any length of time, and was sent to hospital for examination and treatment of his antrum.

An intelligence test revealed his I.Q. to be 82.

Treatment.—From 1.xii.36 he came regularly to play groups under the charge of the Social Worker. On 19.iii.37 he went back to school ; he said that he liked it, but on finding that he had to do manual work he did not stay. He said he could not give his mind to manual ; when he tried everything went wrong—the lines went crooked, the chisels slipped, fretsaws broke and so on.

On 7.iv.37 he went to school again and ran away from the gym. class and said he was frightened of everything to do with school. He was sent for a country holiday, but ran away because he said he was not allowed to run about and was treated as an invalid.

30.viii.37 : Play Therapy was started ; he was taken partly individually and partly in the group. From the first it was noticed that his constructive work and carpentry, of which he did a good deal, was excellent, so that there was no real basis for his fears of the manual class.

His mosaic was an anxious, rather feminine pattern, impulsive and unconventional in colouring, being entirely green.

It was explained to him why he came to the clinic and played and the question of school was discussed. He said that he did not know why he was afraid of school ; he just could not go. We agreed that we must find out why and that school must stand for something else ; that there must be something in himself which made him fear school.

His work in the playroom can be roughly divided into four stages :

Stage I is concerned with violence ; he did worlds in striking contrast to the softness of his general appearance. The first two were of unspecified war. These were followed by a number of fantastic worlds about cowboys and Indians. In all there was fighting and aeroplane crashes ; one side was trying to get land from the other, and the rivers were full of crocodiles. In the next world the conflict was more localized in that there was a king's castle ; the land was invaded by enemies ; when the land was at peace once more the king had gone. Picture thinking had been explained to him, and in the discussion of this world we came to the conclusion that the presence of the king had something to do with the reason for the fighting.

The violence expressed in these worlds was so out of keeping with his quiet, girlish appearance that it seemed likely that they represented feelings which he was refusing to acknowledge and of which he was afraid. It was, therefore, put to him tentatively that " the something in himself " about which we had decided to find out might be rather aggressive. The next world confirmed this suggestion :

This world represented a cowboy ranch. On the left was their house ; cowboys were walking about, and a little girl who lives with them was riding on a pony. There were two fields enclosed

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by fences; in one were a large number of horses, in the other was one horse. This one horse was shut away by himself because he was so wild he would let all the others loose if he were with them.

He was now given the "wishes diagram." Then we discussed the possibility of there being two sides to the self, one side which we showed to people and another side that we did not like and kept shut away. This side that we shut away sometimes seemed to be wild, and that the presence of the wild horse in his world indicated that he felt this about part of himself. It was pointed out that feelings are a form of energy like electricity; they could be used constructively or destructively, and were neither good nor bad in themselves—it depended on how they were used. The part of himself that he was shutting away was really a fine, strong part that could help him to do a great many things.

Stage II.—His interest in cowboy worlds now disappeared, and he became interested in fire and water.

He started to build a fire engine with meccano; he was asked if he would like to make a fire; he assented eagerly. He made a fire in the yard, and when it was burning well he at once put it out by squirting water with a tube attached to a tap. He remarked that he would like to burn a house.

The next day he also made a fire.

He was asked what he thought about fire and he said it destroyed things; it was pointed out that fire could also be constructive—it could warm a room, and was used for making things in factories. He was reminded of his worlds, and he agreed that the world seemed to him to be a place where everyone fought everyone else; his idea was that if there were no soldiers there would be no war. It was pointed out that just doing nothing did not help; one had to do something towards peace. He himself then linked this up with his refusal to go to school. He remarked that he worked hard at home, but he did not like lessons. We decided that he was a person who only did what he felt like, but, worker remarked, this did not work as one got older.

He now started to play with fire like a cat with a mouse; he douched it and then let it burn up. The fact that water could be both constructive and destructive was pointed out again. Next he became aggressive with water, drowning ducks and dolls, and trying to squirt people. His attention was drawn to the similarity between the tube on the tap and his own penis.

Stage III.—This is concerned with his relations to his mother and his dislike of male authority.

With flour he made cakes and had a tea party. He said that he would like to be a woman, then he could stay at home all the time and help his mother.

In discussing school we found that it was a place where you had to do as you were told, and that the school from which he ran away had masters instead of mistresses. From this it was gathered that it was men in authority of whom he was afraid; this was put to him. The next time he came he did a world.

In the centre was a king's castle, towards which soldiers were going for drill. A road passed round the castle, at one end of which was a school. This was on fire. It is a Sunday; in spite of this all the teachers were present and got hurt. One teacher was lying on the ground; the figure, carefully chosen, was that of a motherly country woman. Ambulances and fire engines were coming to the rescue. In the end the whole village beside the school got burnt and the king decided to go away.

The evidence in this world (that it was Sunday, a day on which teachers are not in school, and the figure of the teacher being a motherly country woman) indicated that the school was a symbol for something else. The king leaving when the village was burnt was a similar situation to the one in a previous world, when the king left when the fighting was over, so that king, school and violence had all something to do with each other. The above was pointed out to him. At this point he was also given some idea of what is meant by symbols; we talked about fairy tales in which the king was often the symbol for father; kings and fathers were people who told one what to do and were therefore like school. He was

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reminded that he did not want to go to school as he preferred staying at home with his mother; school took one away from mother. Similarly fathers could take one away from mother, and could get closer to mother. It was also explained to him that he wanted to get so close to mother that he identified with her (*cf.* cake making), and he wanted her to himself.

His play in the next two visits was as follows:

He made a model of the "Queen Mary" in plasticine, also two tugs; we agreed that they looked like a mother with two children; a fire engine put out a fire on the "Queen Mary."

He made a world of a fight between an invading army and the king; the invaders had much smaller guns. Eventually the king got killed and his son took his place.

With this boy one had to be very careful in doing any interpretation, as he was apt to retire into himself unless care was taken. At such a time he would guard himself by doing construction and talk about what he was doing. For this reason the question of the boy's knowledge of sex had not been taken up. It was not, therefore, thought advisable to deal with this last world except in a general way; it was merely remarked that sons often did want to take their father's place.

Stage IV.—After this he did a good deal of enthusiastic construction work. Arrangements had been made for him to attend an open-air school when he was ready to go; at the beginning of November he went to this new school.

His next world was of China, where the land was shared by many people; a welcome was given to this as a new development. He also made a mosaic of a fine upstanding windmill.

A home report made at Christmas said that his mother was satisfied with his behaviour, although she complained that he went too much to the pictures and sulked if he did not get his own way, but she said that all the family did that.

When he came back after Christmas he continued doing construction work; one of the things he made was two boxers and an umpire—curiously the umpire was active and knocked out the champion.

As the pressure on time and space at the clinic was great a provisional discharge was decided upon, though it was clearly seen that a relapse was probable. This was in January, 1938.

At the end of March he once more ran away from school. He had been at home with a bad cold; when he returned to school he found that he had been moved up into a higher class—he became afraid and ran away. He stayed away from school a week; then he took his nephew, aged 11, and tried to walk to London in order to see how high the Tower Bridge was. They were found by the Police at Coventry and brought back. On the nephew's suggestion they had left a note at home to say that they would take poison. Attendance at the clinic was recommenced.

He was a very inarticulate boy, and had nothing further to say about his escapade. A mosaic he made was a hollow circle of pointed pieces showing a combination of feminine characteristics and aggression. His world made on his first re-attendance repeated the theme of a fight for land. We went over what he had done previously, and also the conclusions we had drawn. For the first three sessions his play was as follows:

He made two swords out of wood, put cotton reels on the points. He floated boats in water and was interested in water going in and out. He arranged the doll's house; he put a woodwork bench in the kitchen with a boy on it, and set a girl on the table; the poor baby in the pram he said had nothing to live on; father was looking out of the attic window and mother out of the bottom.

He made a meccano cruiser with one funnel. He did woodwork. Made a world of a canal, on which were boats you get into for pleasure; a road led from the canal round a farm with a mill, back to the canal; it was guarded by mounted police for fear of accidents.

6.iv.38 and 7.iv.38: Sex instruction was given; he had thought babies were brought by storks and dropped.

8.iv.38: He was given "wishes diagram" again; his wish was to do things, but mother stops him because she wants him at home. He messed about with flour and water, and squirted down the drain.

The next two days' play bring up the aggression shown in his earlier worlds. On the first day he became very active and made curious drawing of a skeleton.

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He then made a rifle with wood and stated it was to shoot people with. On inquiry he made the interesting remark that they enjoyed being shot and found it pleasurable. The likeness between the rifle and the tube he had been playing with was pointed out. On the next day he stated that he had taken home his rifle, but his mother had laughed at it, so he had destroyed it. He made a pistol.

During carpentry he stated that when he grew up he was going to Canada with his mother and leaving everyone behind. Worker reminded him about our talk of symbols, and said that water tubes and guns and things like that were often a symbol for a penis. He had taken his gun home and mother had laughed at it; it was as if she had laughed at his penis. He wanted her to admire it, but his penis was still small. His attention was recalled to sex instruction he had received, and he was reminded of how he put tubes down drains. It was pointed out to him that he was fond of his mother and probably had feelings of these sorts in connection with her.

It was discovered that he still slept in his parents' room, as no other sleeping arrangements could be made. An attempt was here made to get his mother to see the parents' physician, but it was not successful.

The Easter holidays now intervened; when he came back he brought a number of toy cowboys and gave them to the clinic, saying he was now too old for them. He said he had also given up the idea of going to Canada. In spite of this, his next world was a return to the cowboy theme:

26.iv.38: Made a world of cowboys trying to make a railway through a hostile land; they managed to finish it and build a town. The Indians still felt hostile, as they thought the train chased away the buffaloes.

28.iv.38: He made roads with chalk on the table; on these were traffic and road signs and police; a man cleaning a lamp-post was the figure of a woman. In one corner was a "posh" house. He spent the rest of the time moulding glitter wax and melting it. On the next two sessions he made a meccano crane—a large, well-balanced affair. He was now wearing long trousers.

2.v.38: He reported having had the following dream: There was a boat floating on the water in which was a girl of his own age; he tried to get into the boat, but he was too small and the boat sank when he tried to do so. For the next three days we discussed this dream. It was pointed out that he was very girlish and rather soft; the dream probably represented his two sides, the big girlish side of him, and the boyish side which had not grown up and could not keep pace with his girlish self.

It was now that it was discovered that his father was a drunkard, who at times became violent. Ronald was asked about this, and he agreed that his father became wild at times; he said that he used to be afraid, but now he was not. It was pointed out that when father is wild one was apt to get the impression that all men were violent beings in general. It was explained to him that when he was small he had probably felt this, and becoming afraid of his own maleness, had cultivated a girlish self.

For some time it had been suggested that he should go back to school; on 6.v.38 he was given a letter to take to school so that he need not give any explanations concerning his absence. During the next week he told lies about having been back to school; he stole clinic property and became very obstreperous. No condemnation was expressed about his actions, but instead the fact that his wild side was now coming out was welcomed.

13.v.38: He went back to school. That evening he attended the clinic and brought back the property he had stolen. He asked to leave early as he had joined a night class for painting.

18.v.38: He asked if he might become a boarder at the open air school; this was accordingly arranged.

From now on he only came to the clinic once a week, as he did not want to miss school. His hero became the modern Highlander; the reason he gave for this choice was that the Scottish people helped us most in the war.

25.v.38: He made a world of a zoo and organized a game of ghost trains.

1.vi.38: He made a guillotine, as he had been reading a story, *The Tale of Two Cities*, in which he said a little girl had been beheaded; he himself beheaded someone for being on the side of the king.

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The next four sessions expressed the idea of restoration; he spent his time mending broken things in the clinic and making properties for the school pageant.

22.vi.38: He made a mosaic of a loose frame, which seemed to be breaking up; in the centre was a pattern which gave an impression of circular movement. The next time he decided he did not like the pattern.

At this time worker left the clinic; the last note made on him was:

20.vii.38: He did another mosaic—a fancy frame with a centre; it was well constructed, but still rather feminine.

He was now looking very well and was much more vigorous. His mother reported at the beginning of July that he was much more confident, less childish, and took pride in his appearance, but she thought he was acting too old for his years (thirteen). At the week-ends he talked a great deal about school, and seemed to be enjoying it very much. So he was discharged from the clinic. In December, 1938, he was interviewed by the Social Worker, who reported that in appearance he was much more boyish and gave a very different impression from when he first came to the clinic. He was still at school and doing very well.

The Case of Peter J—.

This is an example of a child whose difficulties arose in relation to the stages of his own development rather than out of his relationship to father or mother.

Peter, aged 7½, was referred by the family doctor for habit spasms, consisting of head twisting and facial twitching, for fear of doctors and dentists, quick outbursts of temper and a tendency to cry easily.

In this case characterological complaints were the predominating ones and treatment was directed towards these.

Family history.—Father had, all his life, been traveller for a large firm. The patient's circumstances were secure from the beginning. In character the father was egotistic and self-satisfied. He was the centre of the picture at home, and the mother was content that this should be so and agreed with everything he said. The home atmosphere was pleasant, and father was anxious to do well by his children.

Peter was the middle of three brothers; the elder boy, aged 12½, tended to be priggish, like his father, to ignore Peter and to adore the baby, aged 2½. The relations between Peter and the baby were bad. The baby tended to be bad-tempered when Peter came near. Unfortunately there is no information concerning the mother's attitude to Peter.

Patient's history.—He was born in hospital; spontaneous labour; birth weight 7 lb. Breast fed 7 months, weaned easily, development normal. At four weeks old he underwent an unsuccessful circumcision, which had to be repeated twice. For the first eighteen months he slept in his parents' room. Before three he had sustained several blows on the head, accompanied by unconsciousness; at three, it was later discovered, he was isolated in a tent into which the sea came. From 3½ to 5 he had constant bowel difficulty, colitis and worms which, on admission to the clinic, were still being treated by saline injections. At 5 he had measles and tonsillectomy. Bladder control had never been satisfactorily established, and nocturnal enuresis occurred about once a month. At 5½ to 6 he was seen to have erections—he masturbated a little, but not excessively.

History of symptoms.—The tic was said to have begun at the time of the baby's birth. No information was available as to the date of origin of the other symptoms, but the school report described terrible scenes at the appearance of doctors or dentists. At about the same time as the onset of the tic there was difficulty with feeding, as he was afraid of the food being infected with germs.

Temperament.—He was demonstrative, but somewhat unstable in affection, and had a tendency towards secretiveness and hoarding things. He did not show resentment at the birth of the brother when he was five.

School history.—When he first went at five there was no trouble, and he was indistinguishable from the other children. At the time of attendance he was reported from the school to be unable to mix well with the other children, to be

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friendly with the teachers, but ready to adopt any subterfuge to gain attention from them. They complained that he was not very obedient, disliked correction, and showed bursts of excessive energy followed by periods of lethargy. His work was not up to the standard of his intelligence owing to failure in concentration.

Intelligence.—On examination at the clinic his I.Q. was shown to be 137 and his performance age was 11. He was interested in the test, boastful about his ability, and in the performance test was skilful with his fingers.

Child himself.—He was a small, pale-faced, rather worried-looking child, with dark rings under his eyes. He talked a great deal to the social worker about his elder brother, whom he said he disliked and would like to attack if he were bigger ; he did not like the baby much either. When he came for consultation he cried, as he did not know he was coming to the clinic ; he thought he was going out with his parents. He was restless and unhappy in the playroom and did not like the way the children spoke ; he cried about this in front of his parents, but cheered up when they went out.

Playroom.—He made 35 attendances over a period of six months, attending the play group only.

His mosaic was a very neat bungalow, and his first world was exceedingly well planned for his age. It consisted of a road, river and sea on all of which were transport. There was also a farm, garden and petrol station.

His manner at first was very priggish. He was apparently very shocked at the other children, and remarked that he did not like rude talk. Beyond this remark he took no notice of them.

On his first attendance the usual explanation concerning the nature of the clinic was given him and his general situation discussed with him. He said that he hated Sunday School and that there was something his mother told him not to talk about. He agreed that he was afraid of doctors; it was pointed out that this was natural as he had had so many illnesses ; he remarked that he was not afraid of bulls and dogs.

On his second visit a drawing of his first world was shown to him and the form of it was pointed out to him. He was shown that it contained two forms of water and a road; the road separated a garden from a farm. He then made a world which repeated the same features in a different design, but this time there was a fire-engine going to a fire and a breakdown car going to an accident, and a buoy to warn people off the mud-banks. In discussing this world he agreed that although the scene looked peaceful there was a good deal of suggestion of danger.

His play now falls into three periods.

Period I.—One month. During this period interest in transport disappeared, and was replaced by a concern with ideas of dirtiness and cleanliness, of aggression, of bodily excretions and ideas about the body. The period began with interest in containers, dirt, and forcible engines as follows :

A hollow chapel was made out of sand ; round it there was a road, a garage and cannons. At one end was a piggery and a heap of dirt on which was a sentry box ; the dirt was finally put on the chapel roof.

On this day, watching other children play with water, he expressed great disapproval of them.

28.i.38 : The idea of control of water was added.

He made an aeroplane with which he bombed a complicated world of strips of water and land, with dams to keep in the water.

1.ii.38 : On this day paint was introduced and used to colour the fields for a country scene. He then left the world to play with the mincing machine, calling pieces of plasticine which came out sausages. By making one long sausage come out of a pig's behind, which he greatly enjoyed, he reconnected this play wtih the previous country scene.

At this point he was given the " wishes diagram " and asked what wishes a baby might have ; the suggestions he gave were wanting to play with potty, throwing things at mother and other naughty things, all of which he said that mother allowed. He also said that babies screamed, and that he screamed to-day at table because mother put some gravy on his plate, which he did not want ; he emptied the gravy on to his mother's lap (this, however, was not true). This piece of fantasy should have been related to faeces.

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During this day Peter kept on taking things from other children and calling everyone names.

His world was the same as the previous one of the chapel, but this time it had a spire with a cock on top and mother and father coming out of the chapel.

Land and rivers were prominent in the next world, but the interest centred in a boat and boat-house.

On 11.ii.38 the previous world was repeated with the addition of bridges and the sand was coloured.

Much energy appeared now to be released and he became very lively. He was abusive to an older girl because older girls are horrid and shout things at you; he said that she made him spit on the floor. It was pointed out that no one could make you spit; he must have wanted to do it.

The time had come for a revision of his worlds. It was agreed that they showed an interest in things that went along and in things that went up, in objects contained inside other objects and in " sausages " (faeces).

On the next visit the world showed a village entirely surrounded by water—womb-like in shape; beside it was a river of hot water.

At this point it was put to him that the insides in which he was interested might be his own inside and he was asked what he thought about this. He said that he had worms and was given douches (this was confirmed), and it was fun squirting out the water, specially all over the bed when mother wanted it tidy (this, however, was not true). We talked about eating and defaecating, and how things normally went in at one end and came out at the other; while in his case water was put in the end where things normally came out, it was pointed out that things also sometimes came out of the mouth when we were sick, and it must be all rather muddling.

18.ii.38: On the next visit we talked about worms being live things inside, and that other live things came out of holes, for example, babies; he said that he knew all about that. Discussion of the previous world brought out the possibility that the lay-out of the world might be concerned with urine and faeces.

After this he ran about; he wanted to fill a balloon with gas; he tunnelled through a long-shaped mound in the sand and had a plasticine fight with another boy.

22.ii.38: We discussed the fact that he liked dirtying mother; he said that she did not know that he did it on purpose. He was interested in the gas pipe and sure he smelt a stink.

Period II.—During this period his interest was mainly in water. Throughout the first period this boy had been absorbed in his own play and had little contact with other children. This now changed, and his relation with other children became of primary importance.

On 22.ii.38 he played in the water room with the rubber tube and squirted by blowing through it. He tried to join a group of other children, but remained on the edge of it.

25.ii.38: Some boys painted his face, which he did not like, but he made little fuss. He did not retaliate when he was attacked because he said that he had been brought up not to fight, but he turned and attacked a shy boy standing passively by; his attention was drawn to this behaviour.

His worlds now began to contain symbols of emotion and direct movement.

He made a world of a flood, into which a peninsular bridge projected; on it were wild animals, who were not fierce, boats and cars were in the water; cannons guarded the end of the bridge, so that no one could get off.

1.iii.38: He hit the sand aggressively; he said he would like to hit worker; if he had a long nose like an elephant he would blow bubbles over worker; he would have to carry his nose in a barrow. His attention was drawn to the fact that this was like the tube he had blown through last time.

4.iii.38: He ran away from being attacked, but attacked the passive, shy boy. He was restless, but joined with the two others for a while over water.

Water became increasingly important in his worlds; it was associated with roads and transport, and there was evidence that it was thought of as dangerous.

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He did a world in which water was separated into two parts by a road on which was transport. Crocodiles and alligators were in one part of the water and a lighthouse in the other.

In his next world the sea was thought of as attacking, and a road was guarded from it by a strong wall. Dislike of dirt had disappeared, and he messed about happily with wet sand and blew water from the tube on to other children. At this point the records of his last few worlds were studied with him.

11.iii.38: A new feature appeared in his world.

Once again there was a road over rivers carrying cars, but a new feature appeared—there were islands joined by bridges; on one island was a house in which were water snakes and crocodiles. He would not like to live there; the people on the island had tamed the crocodiles, but they would eat the cat. There arose a hurricane which destroyed the islands.

It seemed clear at this point from his play that he regarded the sea as a terrifying and attacking force, and it was worth while looking into his actual history to see if there was any reason for this.

18.iii.38: His world consisted of an island walled round; on it was a house and one man; a crocodile was coming through a gap in the wall towards the house and a ship was going to the rescue.

The fact having been discovered that at one time he had nearly been drowned by being in a tent by himself when the sea came rushing in he was reminded of the incident, and was shown how the world represented his feelings of the time of the accident, though not the incident itself.

On the next two sessions he played with water; was interested in drains. When he pulled something out of the drain he sang an exultant song with the words "England expects." He played trains, he himself being the train, and he told his worker about a gang of boys at school which he had joined.

1.iv.38 was spent in the construction of a complicated world, consisting of a square puddle with outlets at two corners, which led to more puddles. One end of the land was hollow; water goes into this tunnel and he said air and boats come out.

The fact of his douches were here brought back to his mind, and it was pointed out that air often comes out with funny noises from that hole. He said that mother called that rude, but we agreed that bottoms made these noises without us meaning them to.

5.iv.38: He arrived in tears with violent earache; he had had a sore throat on Friday, which was followed by earache. We discussed the fact that he was always having something wrong with his holes.

8.iv.38: A possessive and dominant attitude towards the playroom environment began to show; he ordered workers about, annoyed other children and monopolized the attention of his favourite worker, who had the same name as himself. He played in the sand with another boy, drew an engine, and spent much time investigating the possibilities of making a stick stand upright.

On 12.iv.38 he began to experiment with water as a force.

After asking to see the drawings of his mosaic and worlds, he played with water; he floated boats, which were moved by currents in the water and got wrecked on rocks. A tube, he said, was an octopus and sank boats by squirting into them; it was also a whale and made spouts. He made a good drawing of a ship.

Easter holidays intervened here.

26.iv.38 was a very confused day. He arrived with his thumb bound up, and told a long story of an imaginary train accident in which the seat had jumped up and hurt him; this was accepted, but no fuss was made over it; instead we discussed all the accidents he had had—the blows on the head, the incident by the sea and his bowel difficulties. After this he went round abusing people; he attacked a girl, but grew afraid when she started to squirt him. Once as he was beside her worker accidentally knocked out one of his loose teeth; he was furious because he said that he would not look so nice without it; he soon recovered his composure and decided to take the tooth home. At his request we went to the world tray; he found a horse with plasticine on its foot and said it was making muck. He made a train tunnel in the sand, beside which was a road and a fire station.

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On the following day he felt free to express his ambivalent feelings.

He would not have worker anywhere near. He did climbing feats, made much noise banging basins and said he had hurt his thumb in the carriage door. He thought the clinic and every one in it were mouldy; he said that evidently worker had taken a great fancy to him, but he had not to her; worker said that things did happen like that sometimes.

The character of his worlds now changed.

He made a world of rounded mounds, which were huts enclosed in a wall with a small entrance in it; it was a fort with soldiers attacking it. The idea of mounds was continued the next day (3.v.38), when he made a large round mound that one went over and round and through, exploring it thoroughly.

He then played with the water tube. This play in association with his interest in solid objects and movement in and out was pointed out to him, and it was agreed that his own body had a tube which he called his "willie winkie"; he said that he could himself make fountains as high as the tube could. It was noticeable that the use he made with the actual water was to attempt to get the dirt off the walls.

6.v.38: He drew an engine and used the water tube to drive boats along.

This day formed the end of Period II.

Period III.—This was a social period, and was concerned with his relations to other people. Owing to the exigencies of group work carried out with only one trained worker, rich material here could not be used as the following game was played with an untrained voluntary helper.

He played a game with others, during which he felt things were unfair and always appealed to a grown-up for support. With his worker alone he played robbers; he shot her with a sleeping draught and robbed her of bank-notes; he was put in prison for ten years, protesting his innocence. Later he became invisible, but worker was given notes when she protested that she could not feed her children now he had taken the money; the notes floated down to her apparently from nowhere.

He now contracted mumps, and during this period worker left the clinic, but is indebted to the psychologist in charge, who made the following notes:

28.vi.38: He came back with wild tales of his illness and of the naughty things he had done in class. He told everyone he was back and made rude remarks to attract attention. He made a world of a harbour and of boats having a fight.

During the next two sessions he joined the other children in games of hospital and robbers. In the hospital he was the patient and the windows of the house had to be covered. On one day he was disgusted because his favourite worker was not there; he tried to chop bits off the wall; on another day he would not let a girl into the house.

12.vii.38: He was less aggressive to the girl in reality and in play was freely aggressive with water, shooting at a target with a water pistol. His last world was of roads and traffic made in an ordinary boy's way, and on this day he made a mosaic of a beetle—it was a good attempt.

Owing to the great improvement that was shown at home and at school he now ceased to attend the clinic. The home reported the habit spasms had disappeared, his health had improved and there seems to have been no further trouble with his bowels. The fear of doctors and dentists had also disappeared. His father and mother found him much improved; he was more boyish, less tearful, and far more detached from his elder brother. An opportunity of studying his behaviour occurred when the family were away for Easter; they noticed with satisfaction that he had grown in independence.

The school reported that he appeared to have conquered his lazy fit and to have normal concentration. There were now no scenes in connection with doctors. He was in a very bright class and did not stand out in any way. The only point in which he was different from other children was in certain aloofness in his manner, and he did not mix as well as he should with other children.

From the material brought up it is clear that only a portion of this child's primary system has come to expression and that, were the circumstances ideal with

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adequate opportunity for skilled work and no pressure on space, it would have been more satisfactory if this child's case could have been carried further. The rapidity of movement, on the other hand, and the child's capacity for assimilating his own primary system thoughts, suggests the probability that, provided that circumstances are not too unfavourable, normal processes of growth and development now started will continue into adult life.

The next two children provide examples of the way in which the same mechanism can express itself in totally different ways. These children did not want to grow up; in one the shrinking from life expressed itself as hysterical paralysis, in the other as a failure to read.

The Case of Ivy K—.

Ivy, an only child, aged 9½, was referred at the end of November by the Assistant School Medical Officer for hysterical paralysis. The history of the complaint was as follows:

Six weeks before she was referred to the clinic, she had complained at school that she had knocked her hand on the cloakroom pegs. It was impossible to move it from her side, she held it so rigidly, though there appeared to be nothing wrong with it; she did not move her arm for over a week. Then her leg from the knee down became stiff; she was admitted to hospital and kept there a fortnight; she was in bed the first week and walking the second.

At the beginning of the year she had been treated for acute rheumatism; her legs were wrapped in cotton-wool and she was carried from room to room. She was sent away to an aunt for a holiday and the "rheumatism" cleared suddenly. When she returned to the aunt with whom she lives, she once more complained of pains. Unfortunately it was not discovered whether the pains were in the arms or legs, or whether the pains had continued and cleared up before the incident of the pegs.

Family history.—The family is Irish, and they lived in Ireland until the mother died of tuberculosis three years before. Previous to her death she had been a semi-invalid for several years. The grandmother used to live with them and looked after Ivy; but a year before the mother's death she died. For the final year a succession of aunts took charge of the child. After his wife's death the father came to Birmingham with his daughter; he lived with a member of his family apart from Ivy, who stayed with another aunt. He saw her once a week and seemed really fond of the child. He was busy courting and hoped to get married, but was vague about his plans. In temperament he was said to be irritable; he resented Ivy's illnesses, as he had to pay the bills; when she had pains he told her to forget them.

The aunt, who was Ivy's guardian, was a large, ungainly woman of most unprepossessing appearance. She was rather resentful of Ivy's presence in the house, since she had only taken her temporarily and did not know at the beginning that she would have her for three years; Ivy's father only paid 8s. a week for her keep and her aunt said that she ate more than that. To make matters worse, Ivy was always ill.

The patient.—No early history was available. She remembered her mother dying when she was 6½ and could describe the death scene vividly, although at the time she was in another room listening; she was present at the wake. She is said to have tried to commit suicide by attempting to run under a train after her mother's death.

When she was left with her aunt she screamed and kicked, saying to her father: "Mummy said I must live with you." On arrival in Birmingham she was quite healthy; since then she has had measles, mumps and tonsillitis; suffered also from intermittent rashes described by the aunt as red patches and lumps, which disappeared as suddenly as they came. Although, to us, the aunt appeared resentful, yet she had very much pampered Ivy during illnesses.

In temperament she was said to be excitable; she always dreamt after any excitement and wore holes in the sheets with her feet. She had dreamt of black men who killed her mother, and also of her father getting married again. She liked her future step-mother, but would rather her father came to live with her aunt, of whom she was very fond.

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School report.—She was usually top of her form, but was inaccurate in handwork. She was friendly, but shy and retiring with children of her own age, and apt to play with younger children.

Intelligence test.—I.Q. 111. Her performance age was between 10 and 11. She was methodical and neat, but seemed rather babyish in expression and manner.

Treatment.—She made sixteen attendances over a period of three months; during this time play therapy was given in the play-group only.

In appearance she was a cheerful, round cheeked, healthy looking little girl, but her aunt stated that she was coughing a good deal at night. In manner she was frank and natural. She was interested in her aunt's many operations and illnesses, and determined to get her due in life. She showed a good deal of insight into emotional problems. Her mosaic was of a good growing type, but very simple for her age and intelligence, and placed slantingly on the paper as if the balance had become upset.

Her first world (7.xii.37) was a straightforward picture of conflict. The tray was divided into half; one half was sea, the other land; the white people from the sea were fighting the black people on the land.

In discussing why she came here and played she said it was because " things happen and you don't want them to." Picture thinking was given, and it was pointed out that she had made a picture of two things fighting each other, and that this might be a picture of two bits of herself; for example one sometimes wanted two things at the same time and the two wishes fought each other. She immediately gave an example of this, saying that once she had been asked to a party and also to go to a Shirley Temple film both on the same day; she had not known which to choose.

On 8.xii.37 and 14.xii.37 she made worlds of a park or pleasure garden outside of which were houses, roads, etc. In the park were people enjoying themselves and a man was selling ice-cream. There was also a little girl going to school; she had to leave the park to do so. She emphasized the fact that one had to pay to get into the park.

16.xii.37: She made a world of a farm; the house had a garden round it. The cows were being milked and one milkmaid was just fed up with work; she would like to go and sit in the garden.

From the worlds, it seemed that her desire was for a life of idle pleasure and no work. Her previous worlds were gone over with her and linked with her latest one. We remembered that the little girl in her previous world had to leave the park in order to go to school, and that the park was just a place where you enjoyed yourself; outside the park you had to do all sorts of things like work. She was asked if she was not rather like the little girl who did not want to leave the park to go to school. She said that she was; she would like to have nothing to do but go to parties, and at school she liked the concerts. Worker said that there were many ways of getting out of work; one way was by being ill. Ivy then told worker about a girl at school who got headaches and had a lovely time; but Ivy said that she just pretended to have headaches, but that she herself did not pretend to be ill; she really was ill. Later she said that she often had pains, but they went away when she wanted them to.

She then related a dream in which her father got married; she did not want him to marry as she would have to live with him and then she would have to work. So we came to the conclusion that being ill meant you could do what you liked. She said that she did not like it when she had to stay in bed with an illness like mumps—that did not go away when she wanted it to. We talked about her mother's death; she said that she had been in the room when her mother died—her cot was in the opposite corner from her mother's bed. She said that when her mother was ill her mother did not have to work, but Ivy had to get up and light the fires. The implications of this were pointed out.

On the next visit she did some crude paintings of girls playing at different games and constructed a house with Minibrix. The Christmas holidays now intervened. On return:

11.i.38: She did a painting of a garden in which were flowers and a swing.

13.i.38: She did a world of a seaside where people were just enjoying themselves; she agreed that this was her ideal place.

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We discussed what we had done last term, and remembered that we had found that people became ill so as not to work; she remarked that it was not nice being kept in bed, and we thought about the idea that there were other and better ways of having a good time, and that even work could be very nice. She thought about this for a while, then agreed, saying that she liked scrubbing floors.

18.i.38: She was given "wishes diagram" and worker said that she thought Ivy had two wishes which fought each other; one was to be a nice strong girl who could do all sorts of things, and the other was to be ill so as not to go to school. She said that she did not really like being ill now, as she had to go to bed; what she really liked was lying on the sofa and reading, but her aunt said that she must be tired when she did this and sent her to bed.

The next time she came she spent her time making more and more difficult models out of Figuba. Worker told her that there were two kinds of pleasure—the passive, sensuous pleasures and the active, striving, creative kind, and that the latter gave great satisfaction—we needed both types to get the most out of life.

27.i.38: She did a world of a farm; the farmer has a garden, into which he goes on Sunday. A maid is fed up—you can tell that because she has her hands on her hips. She is fed up with milking and would like half a day off to go to the park, though she would not mind scrubbing the floors. When asked she said she would like to be a queen but not a princess; she likes the story of the "Seven Wild Swans," but the princess had a horrid time. If she was a queen she would wear pretty clothes and drink lemonade. She was told about the limited, hide-bound lives that queens in reality led.

During the next two sessions we talked about father; it appeared that he was most unsatisfactory; he would not even make a doll's house for her; she had found this out about him long ago, but it had been specially marked since they came to England; worker agreed; he was not even able to look after her. In Ireland her mother used to see that he did as Ivy wanted.

At this point her aunt was interviewed by the Medical Director. She was full of resentment against Ivy's father; he seemed to be making no move to get married and was behaving in a very irresponsible manner. She was advised to give Ivy more scope and to isolate her if she were ill and not indulge her too much.

10.ii.38: She did a world of the Mourne Mountains in Ireland, near where she used to live. The English and the Black and Tans were always fighting. She said that people over here did not quarrel so much; her father used to quarrel a lot. We agreed that the family were quarrelling over her, and it was suggested that things were not so nice as they might be; she replied that sometimes they were not and sometimes they were even nicer than that.

During the next three sessions she did some difficult puzzles and played house games in which she was the efficient housewife and mother. We also had the following talk: She had dreamt that she had lost her aunt; she telephoned her and could not get through to her. She agreed that her aunt did talk to her father about Ivy going to live with him; this must feel as if her aunt did not want her, but worker said that her aunt would never leave her until her father got married. Then it came out again that she did not want to live with her father because she would have to work every day. She does not mind working now and then, in fact she likes it; but in Ireland she had to get up every morning to light the fires. She was reminded that we had decided that she was ill so as not to work because her mother did not work when she was ill. But she realized that people were sometimes ill and had to work; her aunt was not well, but she had to get up.

She did not come for several sessions. A home visit was made, and the aunt reported that Ivy's cough had disappeared and, moreover, if she had a cold she refused to go to bed but preferred to carry on as usual. Owing to the improvement in her general attitude her aunt had decided that she need not attend the clinic any further.

The Case of Jimmie G—.

Jimmie, aged 12, was referred by the school for being backward in reading. His reading reached only the five-year level.

The home surroundings were very unsatisfactory. The father, a very rough-looking man, was an unskilled labourer, in and out of work. When in work he was lavish with his money; when out of work the children had little to eat.

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The mother died when Jimmie was between three and four, and for four years he was put into a home. Then the father married a large, rough-and-ready Irish woman; she had a grown-up family of her own, who had all been in cottage homes until they were wage earners. She was little at home with the children, as she was a cleaner in a public-house, but she was said to be very fond of the children, who, indeed, always spoke of her warmly.

Of the children, a sister of 14 and a brother of 13 were both normal; a sister of 9 was attending the clinic for pilfering. They all looked neglected.

The house itself was in a slum, but was reasonably well kept and furnished. It was very noticeable that the adults were much better cared for than the children.

The patient.—He was the third child. Very little information could be obtained regarding his early history. When he was two his mother was in a sanatorium; she died when he was between 3 and 4. Up till then he had been a delicate baby. For the next four years he was in an institution and gave no trouble. As regards his behaviour at the time of referral, his father and step-mother had no complaints to make.

School report.—One year before admission to the clinic he had been recommended for a special school on account of his backwardness. He was only able to read a few words of two letters; his writing was poor and his arithmetic inaccurate. He was said to be troublesome, crafty, untruthful and defiant. He was tested and his I.Q. was found to be 78. The father denied that Jimmie was troublesome and refused to co-operate.

On admission to the clinic he was reported to be reading words of four letters, his arithmetic was below average, while his handwork was fairly good but untidy.

Performance tests.—These were given at the clinic and his results were normal. The psychologist reported that he was interested, quick and neat. He chattered a good deal about what he was doing and seemed normal in behaviour except that he was childish and undeveloped for his age.

Treatment.—For three months he attended the playroom and was also given special coaching, but his reading did not improve. In September, 1937, Play Therapy was started; he made thirty attendances over a period of 7½ months. During the first half of the period he was taken in the group and afterwards individually.

In the playroom the most striking thing about him was his gentleness. He was a quiet child, kindly and polite. It was with surprise that one realized that he was twelve years old; he appeared to be not more than nine.

The following are the main points revealed in his play: He wanted to remain a baby in order to escape from the horrors of life, the fighting and the danger which really surrounded him in his bad slum environment; he also dramatized his struggle to grow up. He had a fear of his own natural feelings of anger, which he was apt to turn against himself. His mosaic, worlds and newspaper game were very undeveloped for his age.

His first world expresses his feeling that the world is a dangerous place, and even apparently commonplace and safe things are really not to be trusted.

31.viii.37: The sand tray was divided into two by a road, on which two cars had crashed. On the right was a mountain, through which went a tunnel which ended in a trap; it was the scene of a fight between black and white men with animals joining in the fray. On the left was an apparently peaceful farm, but Jimmie said that soldiers could easily climb into the farm, and the pond from which the horse was drinking was really poisonous red dye.

In his second world (21.ix.37) an army was coming into the jungle to get animal skins. One elephant was going up the mountain, while the other was going into the cave; he said the latter was going the easier way.

21.ix.37: After making a confused world of a fight he put his hand in worker's and said: "I am a little baby." We went and played with baby toys for a while and he finished up with construction work.

A word might here be said about the use of construction toys in work of this kind with children, as their value is sometimes disputed. A shy child will often start by playing with construction or simple pattern-making toys. These give him a feeling of safety, and in quietly working he becomes accustomed to the playroom, and gains confidence. The discouraged child, who has never been able to succeed in gaining adult approval, will, after a while, do some simple construction. If he

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finds that he is successful he will go on to more difficult work, until he finally realizes that he can do as well as others. In the same way a child who has been referred for inability to concentrate will gradually come to set himself tasks as treatment progresses. When he finds that he can decide to make something and actually carry out his intentions and finish a model he has started, then he is well on the way to improvement. The presence of adequate material helps him to canalize the energy, which was formerly aimless and scattered, into constructive channels. Again the child who, like Ivy K—, has always thought of work as unpleasant, can learn that this is not necessarily true.

There is also another very valuable use for construction toys which is illustrated in this case. Very often after a child has had an aggressive outburst, has been very messy or behaved in a babyish manner, as in this case, he will, for a short time, turn to construction work. In this way they, so to speak, pull themselves together, they relate the two parts of themselves which are incompatible, the childish part of the self and the older part, the destructive with the constructive, and this serves to prevent the arousal of an undue amount of anxiety or guilt, which can lead to resistance to further treatment.

To return to the case. On 23.ix.37 we discussed why he came here and played, and we discovered that reading was his only difficulty; he gave worker a lesson on the eye which he remembered very accurately, relating the details and carrying out quite good drawings of what he was describing. From his second world and the fact that he was so young for his age, it seemed probable that he liked taking the easy way when he could. He was shown the drawing of his world, and reminded that the elephant going into the cave was taking the easy way, while the elephant going up the mountain was having a more difficult time. The idea was put to him that if he climbed the mountain he would have a much more interesting time than if he went into the cave, where he could see nothing.

5.x.37: He sucked the baby's bottle and behaved like a baby.

12.x.37: He was given the "wishes diagram" and we found that he was interested in the body and how it worked; so we talked about this and sex instruction was started. His knowledge of how babies are made was culled from the catechism.

There followed a series of confused worlds, all of which were divided in two by water.

9.xi.37: Water again divided the world; it was the Red Sea which a man was busy making. On the far side of the sea there was a petrol station and a great deal of fuss over traffic which could get nowhere. A horse was being whipped for being afraid to cross a bridge.

24.xi.37: The sea divided the tray again, but it went from top to bottom instead of from right to left. On the right was a Chinese village in which lived a lazy elf (he chose a Chinese figure for this), who enjoyed looking round. There were bridges over the sea, two of which one had to pay to use; the third was free but unsafe. On the left was an English farm, which contained, among other things, a "mad-headed" bull and "greedy pigs."

At this point all his worlds and other play were gone over with him, and the various points noted. It was also pointed out that water seemed to him to be both precious and dangerous, and that the lazy elf was like the elephant who went into the cave. The traffic in the world of 9.xi.37 was likened to himself, who was always busy about something, but never got anywhere, though the man who was making the Red Sea was showing a more creative desire. Following on this he did a very dramatic piece of water play.

1.xii.37: He filled the sink with water. He chose the Chinese figure (before used as the lazy elf) and said it was a little boy. A little boy and girl who were brother and sister (his sister also attended the clinic and was very babyish) were under water. There was a man with a whip (the same figure who had whipped the horse in the world of 9.xi.37), who could go under water and come up again when he liked. He pulled the children up from under the water, but they fell in again; once more they were rescued and rode on a duck's back, only to fall in again; this struggle took place several times, and at last the girl managed to stay above water, but not the boy. Finally they both managed to stay above, but had to be hidden inside a boat which was covered over to prevent them being shot at by men at war.

We rejoiced over the final victory, realizing that it was easier to stay below, specially when it was dangerous up above, but that the children lost a lot by not

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coming up. It was pointed out that the elf and the little boy were very likely a picture of himself.

8.xii.37: He once more did a world divided into two by water. On the left was a farm with pigs eating; a small horse escaping from the big ones was going to get a drink; men were either fighting or getting on with their work. On the right was an aerodrome; aeroplanes came and bombed the farm. Then the aerodrome became a jungle, which was itself attacked and all were put in prison. The whole world was then destroyed, and Jimmie remarked, with great satisfaction, that the world was now upside down.

The next time he came we finished sex instruction. He was reminded of the water play; we discussed the struggle he had depicted and how it is like the struggle of birth. Growing up was like being born again; one had to leave baby things behind; it was a struggle, and one had to make an effort comparable to the effort made by the elephant who went up the mountain, while the elephant who went back into the cave was like the boy falling back into the water.

He played with the Russian doll, and he pointed out to worker how the seed grew up into a little baby and then grew bigger until he became an old man. Jimmie made the baby knock out the old man. When the dolls went inside each other he said they were in prison. He made a world in which there was a statue of a woman milking; the baby doll tried to climb up the statue and succeeded, but the man with the whip knocked him off. There followed a confused muddle of men being aggressive to each other and everything kept on being put on roofs.

While this play was in progress worker kept up a running commentary on what he was doing, pointing out that a mother gives milk and that babies want to get to her; in his world a man is preventing this.

22.xii.37: He made a lorry out of meccano, put a man in the lorry and made it go up a slope and crash down on the other side; the man in the lorry did not like it, but had "to lump it." This play continued the whole session to his evident satisfaction.

The Christmas holidays intervened.

12.i.38: He started off by making a world of a farm full of things attacking and being attacked. On the right was a river, over which went bridges. He decided it was a pond and put a windmill beside it. Whenever it rained the pond overflowed its banks and the windmill took the surplus water out and put it back in the river. Two horses were put in the stable because they ran away from their masters and had to take their punishment; two others, however, were escaping. Another horse ran away from the trap, but had been caught and put back. In the pig-sty there was one big pig, who was greedy and must have one big trough to himself, but his baby shared it. A rabbit was at the entrance to his burrow and a stork was about to peck him. Two wild bulls were fighting and a soldier was about to shoot them, while a mad bull was jumping over a sheep with a lamb and a soldier was shooting him. Some men were making horse-shoes and nails. The little elf was sitting on the wing of the windmill and was having rides; at one point he fell into the pond, but managed to clamber out into a fishing boat.

All this showed the sense of danger by which he felt surrounded. In the discussion which followed the elf was likened to Peter Pan, who would not grow up like Jimmie. In talking about his play and the idea that under water was safe and above water dangerous, it came out that people at home were sometimes rough; it was pointed out that to a small boy this must have felt as if everyone wanted to fight everyone else. He said that the greedy pigs in his world were what he was sometimes. For the next few sessions he did construction work of a rather babyish kind that he used to do in the infants' class. Worker talked about passive and creative pleasures and the merits of both of them.

Jimmie now said that he was better at reading and was getting half marks at school. The school also noted improvement, while his coach said that he was better, but erratic; one day he would be good and the next day very poor at his reading. The home situation, however, was, if anything, worse.

16.ii.38: He made a world of a river in one corner heavily fenced round to prevent boys falling in. On the far side were wild horses; on the near side was an army getting ready to fight black people who want the land. He made a remark to the effect that water was the most important thing in the world.

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This last remark was taken up; water was both necessary to life and dangerous. When he sucked the baby's bottle he was drinking water; that was a picture of drinking milk from mother. This was the valuable aspect of water, but it became dangerous when the desire for it kept one a baby. We talked about his mother; he said that she had died when he was four; she used to read to them. Worker found that he never attempted to read for himself; it was suggested that he might start to do so.

His inability to read was, therefore, connected with his mother, and was a symbol of a desire to return to those happy days.

The next day we discussed the wildness in his worlds and how the wild horses were shut away, and that sometimes we felt that a bit of ourselves was wild and we wanted to shut it away; but this did not do; we must allow this wild side to come out, etc. Referring to a previous world in which mad bulls attacked and horses escaped from stables, it was said that we must learn to face mad bulls and to escape from stables. He then did his most coherent world.

He did a world which consisted of roadways; men were putting up telegraph posts; a fire-engine was putting out a fire. There was a break-down car going along the road and a milk cart was upset.

6.iii.38: He did a world of a terrific fight between black and white, which was carried on on both sides of the river; animals joined in the fight. Everything got knocked about and the wind blew the trees down. He then did a painting, which he called a "picture of changing colours."

23.iii.38: He made a house out of Bayko, white steps leading up to the dungeon on the top of the house; from this a man is committing suicide because he had stolen something.

The next time he came worker asked him if he ever felt like committing suicide; he said that he did when he was angry at his father hitting him; father used to be horrid, but he was not now. We talked about angry feelings and how we all had them, and that it was right to feel angry when people were horrid to you. He spent the rest of the time making a steam roller run over a policeman.

6.iv.38: In the sand tray he made a picture of a fight, and we agreed that it was much better to fight than to commit suicide, and that when father was horrid it was better to be cross.

13.iv.38: He told worker that he was now getting tough; he belonged to a gang that fought another gang. We agreed that it was good to be a little tough, as long as we were not the kind of person that went round fighting everyone else. He said that he was now reading the printed matter under the pictures in the *Daily Mirror* and working out the words for himself.

7.iv.38: A school visit was made and the headmaster reported that Jimmie had improved considerably during the last six months and seemed more cheerful. He was being given special work suited to his capacity.

As worker was leaving the clinic it was decided to discharge him, although he required more treatment. But as he was now making an effort to grow up, the improvement would probably continue.

Results of Cases.

This is a suitable point at which to consider the aim of treatment. The importance of the symptom lies in the fact that it is the means whereby the child comes to the clinic. The disappearance of the symptom for which the child was referred does not necessarily mean that treatment has been effective; while, conversely, the result may be satisfactory though the symptom may remain. In considering the results of the cases outlined we can see whether or not the aim of treatment has been achieved. In January, 1944, a home visit was paid on each case.

Peter J—: Both parents were very pleased with Peter, now aged 13½. They considered that he was much better in every way than he was in 1938. He has lost all fears of doctors and dentists, and faces without fuss situations which he anticipates will be unpleasant. He is very resourceful, is a leader and organizer, and makes many friends wherever he goes. He is keen on sport and doing well in his work at school, but he is apt to be critical of others. Formerly he was very awkward with his hands, but now is dexterous. He is still very demonstrative, and sometimes weeps when upset. The parents were a little worried because he formed friendships with older girls, such as the lift girl in a shop who gave him rides.

Some anxiety, however, still remains. Occasionally he shows traces of habit

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spasms when he is tired or over-excited, and sometimes he gets dark rings under his eyes when he is worried. He has also occasionally wet his bed. As was stated before, Peter should have had a longer period of treatment, and for such cases an occasional return to the clinic after discharge would be valuable.

Ronald B—: Ronald is now nearly 19. His mother is very pleased with him. He enjoyed his last years at school and still visits the staff when he is on leave. He joined the Home Guard when he was very young and the army as soon as he was old enough, insisting that his mother should give her consent. He is now in the Middle East, enjoys army life, and the sergeant says that he is a smart chap. He can stand up for himself and no longer bothers about his father, who still drinks heavily. He has a girl, whom he hopes to marry in September. From his photograph he appears rather older than he is—looks quite grown-up, and has a certain "air" about him.

This case seems very satisfactory; he has been able to accept completely his manhood, and to go forward in these exceptionally difficult times with courage and cheerfulness.

Alfred W—: He is now 16 years old. There has not, of course, been any return of the arson and factory breaking, and until he started work he seems to have kept well and fairly cheerful, but he has not been able to stand up to the very great difficulties which have come his way, and the case is, from our point of view, a failure.

In 1940 his mother and father died within five months of each other; after this he seemed bewildered and became quiet. He went to live with a married sister, who is a slattern. Their house stands in the midst of a badly damaged part of the town. He works in a boot and shoe repair shop, where he likes the work and gets on well with the men. He was not upset by the blitz and, appropriately enough, enjoyed putting out incendiary bombs; he hated being in the shelter.

He has, however, returned to the state in which we found him; he is withdrawn and depressed, is a bad colour and has frequent attacks of bronchitis. In addition he shows mitral disease of the heart, which he has probably had for three or four years. He has few friends, and rarely goes out except to the pictures. Occasionally during the interview he became animated and seemed then a different person. He has since been seen at the clinic, where physical treatment has been arranged for him.

Ivy K—: She is now 15½. Her father remarried in 1939, and Ivy went to live with him. She did not get on with her step-mother, and was jealous of the step-brother, so three years later she went back to live with her aunt, where she would like to remain. There has been no return of the paralysis nor of the pains in the legs, and the persistent cough has disappeared. She has occasionally small ailments, but soon forgets about them. She is still excitable and moody, and talks in her sleep, though she no longer wears holes in the sheets. She works in an office, where she has been given an excellent character and is very keen on her work. She has joined the G.T.C., which she enjoys and goes to socials, where she mixes well with the boys.

This case is fairly satisfactory in that she has been able to deal with her rather difficult situation without reverting to her former symptoms, and she has learnt to enjoy work, but she has not been able to accept her father's remarriage, and remains moody and restless at night.

Jimmie G—: The stepmother reported that Jimmie, now 18, had played well with other boys, could stand up for himself and did not any longer give in to everyone. When he left school he worked on a woodcutting machine and was earning £5 before he was 16. He looked after his own interests at work and saw that he got his rights. He is very good with machinery and made beautiful toys, which he designed himself. He joined the army as soon as he was old enough, having attempted to join when he was 16; he passed "A" for a driver.

He never really learnt to read or write until he went into the army and wanted to send letters home. Considering his low intelligence (I.Q. 78), the fact that he was not interested in learning to read is not very important, and did not interfere with his good mechanical abilities. In spite of the fact that the symptom for which he was referred did not disappear, yet the aim of treatment was achieved—he did grow up and become a thoroughly responsible and useful member of the community.

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REVIEW OF LITERATURE ON THERAPEUTIC PLAY TECHNIQUE UP TO 1942.

For the proper understanding of any piece of new work it needs to be seen against a background of work of the same kind which is already in existence; a review of the current literature in Great Britain and U.S.A. was therefore undertaken. It is realized that this survey omits all reference to work done on the continent of Europe which has not been translated—war conditions making such reference impossible.

The sources consulted by the writer were confined to the English language journals contained in the library of the British Psychological Society and such books as she has been able to obtain. It has been difficult in war time to read the available literature while holding a full-time post; in consequence some of the literature may have been missed. The writer would like to apologize in advance for any such omission.

As so often happens with new discoveries, that play could be used therapeutically was guessed at twenty to thirty years before its discovery by psycho-analysis. In the Mitchell Library at Glasgow, by accident, the writer came across an extremely interesting booklet entitled *What is Play?* by Dr. John Strachan, published in 1877. In this booklet the author urges the need for more play in schools to better the physical and mental health of the children. In addition, in a chapter entitled "Play in Education and Training" he makes the following remarks: "The time to reform our criminal classes is while the mind is being formed, when, through the agency of play, much might be done to make it grow in conformity with the requirements of society. The associations of a child during play and spontaneous mental activity will inevitably lead the mind into corresponding channels of development, and no amount of school instruction will alter the children thus formed."

Strachan further suggests that there should be a building where the young criminal would have more chance of play than anywhere else. He remarked that it would need no officer to compel them to attend, and much influence could be exerted on them in their play.

John Strachan, therefore, antedates Froebel and Groos by nearly twenty years, and the first paper on the therapeutic use of play by fifty years.

Play in Psychoanalysis.

The first analysis of a child was undertaken by Sigmund Freud, first published in Germany, 1909, and in England, 1925, in *Collected Papers*, vol. iii, under the title, "The Analysis of a Phobia of a Five-year old Child." The analysis was mainly carried out through the agency of the parents. Between this date and the date of writing (1942) two main schools of thought have developed within the body of psychoanalysis, which are associated with the names of Melanie Klein and Anna Freud. Also within the framework of the Psychoanalytic Society and with a loose general adherence to one or other of the main schools of thought a number of variations in technique have been reported on by various authors.

The first to undertake systematic child analysis was H. Hug-Hellmuth, whose paper "On the Technique of Child Analysis" (*International Journal of Psychoanalysis*, 1921, vol. ii, parts 3 and 4) is the first publication of systematic case material. She maintains that the aim of child analysis is character analysis, and the restoration of the psyche to health and equilibrium and the adaptation of the individual to his life and vocation. In all children it is mainly psycho-analytic education which takes place, and no analysis proper can be carried out with children under 6 or 7. Play enacts an important part during the whole of analysis under the age of 7, but after that is purely the bridge to treatment. The technique, however, can never be rigid, and should not go too deep for fear of rousing too great anxiety. She gives many extracts from cases of girls and boys of all ages, and points out that in the case of children, avowal, without the use of words, in a symbolic act is often quite sufficient.

In attempting to achieve a coherent account of the development of a special technique for the analysis of children, only those papers which contain a definite reference to a specialized form of technique have been reviewed. Reference has, therefore, been omitted to papers concerned with mental mechanisms of childhood without sufficient description of the method used to show the technique.

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In 1927 appeared Melanie Klein's paper, " Psychological Principles of Infant Analysis " (*Int. J. Psychoanal.*, vol. viii, part 1). This is her first paper to put forward a systematic play technique for the analysis of children. She maintains that the principles of analysis are the same for children as for adults. She gives her reasons for the technique employed and supports her point by illustration from different cases.

In the same year appears a " Symposium on Child Analysis " (*Int. J. Psychoanal.*, vol. viii, part 3). Those taking part were Melanie Klein, Joan Riviere, M. N. Searl, Ella Sharpe, Edward Glover and Ernest Jones. In this symposium Anna Freud's technique is criticized, and a very clear exposition of their own point of view is put forward. A historical summary of child analysis is given by Melanie Klein.

In 1932 appeared Melanie Klein's work, *The Psychoanalysis of Children* (Hogarth Press), which sets out in detail her technique with children of all ages. This work is so well known there is no need for further description of it.

In her paper " On the Theory of Child Analysis "(*Int. J. Psychoanal.*, 1929, vol. x, part 1) (read at the International Psychoanalytical Congress, 1927), Anna Freud, agreeing with Hug-Hellmuth, maintains, in contrast to Melanie Klein, that though some children can be treated purely analytically, others need the analyst to use her influence in an educational manner, to provide the child with new ideas, to change the demands made on the child by the outside world, to correct the child's environment, and even sometimes to remove him from it during analysis ; since in children, Anna Freud maintains, the super-ego is not fully developed, and anxieties are often due to the strictness of the parents rather than of their own super-ego. She illustrates her point by two cases. The first, a boy, aged 11, a feminine, masochistic type, whose occasional aggressive acts were followed by remorse and depression, due to dread of castration by father, is an example where the purely analytic approach was needed. The second, a girl, aged 6, who was apathetic, had screaming bouts, obsessions and fears, illustrates the need for the other approach. Her fear was of the loss of mother's love after the birth of other babies, to whom she was first hostile and later " good." The friendliness of the analyst allowed expression of aggressive wishes and their acceptance without the necessity of interpretation.

Anna Freud's book, *Introduction to the Technique of Child Analysis* (Nervous and Mental Disease Monograph series No. 48, 1928), is now out of print ; the writer has been unable to obtain a copy from the library.

Further Developments.

Hyman S. Lippman, in " Technical Difficulties Encountered in Child Analysis " (*Am. J. Orthopsychiat.*, 1935, vol. v, part 1), discusses the difference between the methods of Melanie Klein and Anna Freud. He accepts Anna Freud's view that the child must be prepared for treatment, and that interpretation must not be given before the child is ready for it or there will be resistance. He gives two cases in detail illustrating this point.

An analytic survey of the differences between Melanie Klein and Anna Freud is given by Tallman and Goldstein at the beginning of their paper, " Play Technique " (see below), and C. H. Rogerson, " Play Therapy in Childhood."

Margaret E. Fries, however, in " Play Technique in the Analysis of a Young Child " (*Psychoanal. Rev.*, 1937, vol. xxiv, part 3), maintains that toys are the stepping-stones to the true analytic situation of lying on a couch, and that free play rather than a controlled play situation brings out the valuable material. She only interprets what can be related to the child's own experience, and finds that even young children can recall and reproduce their own traumatic experiences. The important result of this method, she states, is the character changes which take place after one month without any " deep interpretation " being given. She gives a case in detail of a boy, aged 4½, with feeding difficulties and fear of remaining in a room alone.

Estelle Levy, " Psychoanalytic Treatment of a Child with a Stealing Complex " (*Am. J. Orthopsychiat.*, 1934, vol. iv, part 1), in describing the case of a boy, aged 8½, living with foster parents, stealing and lying at home, but with a good school record, relies mainly on words, but also uses fantasies and drawings. Owing to the child's resistance, early interpretation could not be given.

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Melitta Schmideberg, writing about the same time, says in " Reassurance as Means of Analytic Technique " (*Int. J. Psychoanal.*, 1935, vol. xvi, part 3) that she does not consider that there is only one type of correct analytic technique, the technique employed depending largely on the personality of the analyst. Since the paper deals mainly with adults, its importance in relation to the play analysis of children is that in contrast to Melanie Klein she advocates the giving of reassurance.

The next major worker is Margaret W. Gerard, who has written the following papers: " Child Analysis as a Technique in the Investigation of Mental Mechanisms: Illustrated by a Study of Enuresis " (*Am. J. Psychiat.*, 1937, vol. xciv, part 1); " Enuresis: A Study in Etiology " (*Am. J. Orthopsychiat.*, 1939, part 1); " Symposium: A Case for Discussion " (*Am. J. Orthopsychiat.*, 1938, part 1). In the same volume, part 3, she also contributes to the " Section on Play Therapy." The writer discusses the difference between psychoanalysis and other forms of play technique, and deplores the fact that the two are often thought of as synonymous. She describes very clearly her analytic technique, which she states differs from the techniques of both Melanie Klein and Anna Freud. We owe to Margaret Gerard the first clear definition between play used in a general way for what she terms " superficial treatment," and play used for deep analysis on a basis of a psychoanalytic outlook. Her description of the different forms of play and the difficulties encountered in " superficial treatment " are admirable. Her material is drawn exclusively from a study of enuresis, and in her three papers gives details of over seventy cases; the particular characteristic of her work is its delicacy of touch.

There are two points of interest to note. First the cases who were treated by psychoanalysis were not only cured of enuresis, but showed character changes as well. Second, the clinic where she works now has a group under treatment by use of a play therapy technique in which the conflict is worked through in a more superficial way, and they hope to develop a treatment method which will take a shorter time than psychoanalysis, but be based on the present understanding which has been gained through analytic studies.

Eric Homburger, in the same " Section on Play Therapy " (*Am. J. Orthopsychiat.*, 1938, part 3), also says that the only real interpretations are those done by psychoanalysts. He holds that play alone is valuable, but that interpretations which do not reveal hidden meanings are futile, and are therefore not dangerous but merely superfluous.

In the *Psychoanalytic Quarterly* the following have described individual cases in a fair amount of detail. In 1935, vol. iv, Berta Bornstein, " Phobia in a Two-and-a-half-year-old Child." Steff Bornstein, " A Child Analysis": the writer discusses the reasons for his remarks and actions during the analysis. Editha Buxbaum in " Exhibitionistic Onanism in a 10-year-old Boy " shows how her technique had to be varied, as owing to the child's limited intelligence it was impossible to get his intellectual co-operation. Editha Sterba, " Excerpt from the Analysis of a Dog Phobia," and in 1936 (vol. v), " An Abnormal Child ": she shows how the treatment had to have a different aim from usual; the patient had to be educated to a normal sense of reality. Agnes B. Grieg, in " A Child Analysis " (1941, vol. x), maintains that it is not always necessary to put children's play expressions into words, and discusses when interpretation should and should not be given. She advocates a free use of humour.

The next two papers discuss analytic treatment in a school setting: " Profound Disturbances in the Nutritional and Excretory Habits of a 4½-year-old Boy," A. Pertl (*Psychoanal. Quart.*, 1935, vol. iv); " Franzi," Herta Fuchs, translated by Sidney Biddle (*Am. J. Orthopsychiat.*, 1934, vol. iv, part 2).

Review of Non-analytic Play Technique.

A paper by H. Whitman Newall (*Am. J. Orthopsychiat.*, 1941, vol. xi, part 2) with a valuable bibliography lists and examines the non-analytic variety of play therapy. These he divides into two types, the free or spontaneous and the controlled or standardized. He suggests the spontaneous type is best described by F. H. Allan, Phyllis Blanchard, Maxwell Gitelson, Margaret Gerard and C. H. Rogerson, and the controlled by Joseph Salomon, David Levy and Jacob Conn. The paper finishes by describing the advantages of each form and the indications for the use of them.

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F. F. Tallman and L. N. Goldenstein in " Play Technique " (*Am. J. Orthopsychiat.*, 1941, vol. xi, part 3), who also discuss many forms of non-analytic play technique, describe a form of play used :

" The rules of our play technique are simple, yet difficult to execute. The therapist to be reassuring must be a warm, mature person, who is not frightened either of children or adults, and has enough maturity to allow a constructive interpersonal relationship to develop. Certainly no one who is very insecure or anxious should work with children, nor should people who have a need to punish or who owe too much of their own security to ritual and dogma . . .

" The worker must know clearly that her role is that of an understanding person, that she is not to use her own super-ego in the manner of Anna Freud or interpret symbols *à la* Melanie Klein, that she is to handle children as passively as is consistent with security."

The writers then continue to say that the child must be allowed free choice of play material, even when there is a temptation to use the dramatic approach :

" As the play goes on and transference is organized, projections and identifications rapidly occur, so that the therapist may become father, sister, mother, sibling, teacher, or the patient's self. Children rarely utilize an object as a single symbol."

The child is told why he comes to the playroom, and that he may do as he likes, except that he may not injure people or destroy material.

They describe a form of training which has been initiated in the hospital and emphasize strongly that :

" Workers who use toys, art materials, dramatic effects, or other such media, should know definitely in what category they are functioning. Are they using the technique for establishing rapport, diagnosis, catharsis, or for more inclusive and deeper therapeutic purposes ? Having decided how far it is intended to go—for play is fantasy in action and a good technique is capable of all the various phases above enumerated—the worker should consider the all-important matter of training, background, and adequate control. We wonder if this phase of the problem is always taken into sufficient consideration. Since any approach to children through the media that really touch the child's deeper psyche have a tremendous force for good or evil, it is safe and right to say that no one should ' play ' with play therapy. It is not a simple, easy-to-learn technique, but an approach that needs training, experience and, above all, continuous supervision by a competent psychiatrist who uses the method himself. We strongly deprecate the rather diffused tendency which seems to be current to think that this approach is a knack or a trick easily mastered by anyone, regardless of background. We are convinced that with a satisfactory set-up many workers can safely be trained so that more children may have more psychiatry that is truly child psychiatry."

They describe also the equipment of the playroom.

Carl R. Rodgers, in his book, *The Clinical Treatment of the Problem Child* (George Allen & Unwin, 1939), part 4, discusses in a general way a number of forms of techniques and gives an excellent bibliography.

Specialized Forms.

1. *Relationship Therapy.*—In America experiments have been made in a manipulation of the relationship between the child and the therapist. This appears to have been originated by John Levy, who called his approach " relationship therapy " (see Dr. John Levy's *Relationship Therapy as Applied to a Play Group by Helen Durkin*). Two writers give considerable space to this form of therapy : F. H. Allen in " Therapeutic Work with Children " and a case for " Symposium " (*Am. J. Orthopsychiat.*, 1934, vol. iv, parts 2 and 3) (" Section on Play Therapy," 1938, vol. viii, part 3, and " Trends in Therapy," part 4, " Participation in Therapy," 1939, vol. ix, part 4), and Jessie Taft in " An Experiment in a Therapeutically Limited Relationship with a 7-year-old Girl " (*Psychoanal. Rev.*, 1932) and *The Dynamics of Therapy* (Macmillan, 1933).

In her book Jessie Taft elaborates the views expressed in her paper, making drastic criticisms of the child analysts in general. To the writer the only possible goal in treatment is for the child to undergo whatever new experience is permitted in the living present in relation to the therapist. The object of analysis is for the child to get something out of the interviews as an individual, and be enabled to grow and develop freely wlihout reference to cure or socialization. Two cases, both of

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7-year-old children, are reported in full. She is particularly interested in the relation of the time-limit of the therapeutic session to a child's acceptance of reality.

Reference may also be made to Lowson G. Lowrey and Phyllis Blanchard in " Section on Play Therapy " (*Am. J. Orthopsychiat.*, 1938, vol. viii). Also Lowson Lowrey in " Trends in Therapy " (*ibid.*, 1939), " Evolution, Status, Trends," and Phyllis Blanchard, " Case for Discussion " (*ibid.*, 1937).

An interesting variant of this method is reported by Helen E. Durkin (" Dr. John Levy's Relationship Therapy as Applied to a Play Group," *Am. J. Orthopsychiat.*, 1939, vol. ix, part 3), who worked with a group of eight pre-school children on these lines, the essential of this therapy being :

" In the therapy the pivotal factor upon which all movement depends is the ' interpretation ' of the relationship between the patient and the therapist. . . . It is based on the assumption that the patient will sooner or later ' try ' on the therapist all the attitudes he typically uses to build up his day-to-day relationships. These have become distorted or limited, he may be aggressive or submissive, in any case he will respond in the same way to the therapist. Wrong attitudes will not work with the therapist, yet will not count against him. The therapist will point out to him what his real feelings and needs are. The ' wrong ' attitudes bounce back, so to speak, and so become clarified and eventually drop off, leaving his personality to function more fully.

" The therapist does not respond to factual material but to the sense significance of the feeling behind it. Thus, if the patient asks a barrage of questions, such as ' How can I keep Johnny from biting his nails ? ' if it is spoken defiantly he may answer, ' You want to put me on the spot to-day.' If the child is annoyed at the therapist's impersonal behaviour, ' You feel I am not giving you what you want '."

The general principles of the techniques are :

(1) The therapist should be passive as to group activity, but highly active in sensing and pointing out feelings and attitudes. Specially important are feelings that are unconscious as anxiety is connected with them, so that it is important to reassure when pointing them out.

(2) In order to establish the therapeutic situation it is necessary for the children to play and fantasy with as few inhibitions as possible, so as to make the motivating needs obvious.

(3) See the parents often and be strictly professional and thus help the parent to relieve anxiety and guilt feelings.

The writer holds that the problems which arise are due to the therapist not being completely objective. She also suggests that this technique would be useful as a new nursery school technique in preventing much later troubles by dealing with the great strains of normal tiny children.

Owing to the close relationship between the principles given above and certain aspects of the work in first part of paper described, the principles of this approach have been given in detail.

An interesting comment upon Helen Durkin's paper is formed by that of Annie B. Weiss-Frankl (" Play Interviews with Nursery School Children," *Am. J. Orthopsychiat.*, 1941, vol. xi, part 1). Children volunteered for play interviews whose aim was diagnosis and educative therapy. The child was free to choose among " flexible material " and the therapist took whatever role the child made for her. Much valuable material was obtained which could be used in school and to help the parents.

Reference may also be made to " Therapeutic Effects of a Play Group for Pre-school Children," Susan Burlingham (*Am. J. Orthopsychiat.*, 1938, vol. viii, part 4). Further reference to group work will be found later.

2. *Release therapy.*—This is a form of " controlled therapy " referred to by Whitman Newall. In this method a dramatic topic of standardized design is initiated by the therapist, the child being encouraged to develop the theme as he wishes. D. M. Levy, however, does not confine himself to this tool alone, but finds it useful to combine it with spontaneous play. He maintains that the children selected for this type of therapy must have problems which are not of long duration, and which are due to a family situation in the past. The method was used on thirty-five children referred for a variety of symptoms.

D. M. Levy has described the use of the technique in the following papers in the *American Journal of Orthopsychiatry* : " Use of Play Technique as Experimental

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Procedure," 1933, vol. iii, part 3; "Hostility Patterns in Sibling Rivalry Experiments," 1936, vol. vi, part 2; "Trends in Therapy: Release Therapy," 1939, vol. ix, part 4.

A similar method is used by Joseph Solomon and called by him "Active Play Therapy" (*Am. J. Orthopsychiat.*, 1938, vol. viii, part 3). He confines his children to play situations which are created for them by dolls. Fifty cases have been treated in this manner. In 1940 ("Active Play Therapy, Further Experiences," *ibid.*, vol. x, part 4) he modified the technique by the addition of a doll called by the therapist's name and introduced some play.

Another example of the same type of method is given by Jacob Conn in "A Psychiatric Study of Car Sickness" (*Am. J. Orthopsychiat.*, 1938, vol. viii, part 1). Car-sick children were presented with motor cars and a figure to represent the child and were asked what the doll felt about the car. Their reactions were different from those obtained from children who were not car-sick.

3. *Spontaneous play.*—"Clinical Experience with Play Therapy" (*Am. J. Orthopsychiat.*, 1938, vol. viii, part 3), by Maxwell Gitelson and collaborators, is a long and interesting paper which gives an excellent description of spontaneous play with minimal interpretation mainly confined to reality situations. He pleads for an open mind, specialized personnel and a sensitive technique. He gives a description of the play room. At the end of the paper there is a discussion by other therapists.

Another interesting paper on the value of the free play situation is given by Paul Homer in "Use of the Play Situation as an Aid to Diagnosis" (*Am. J. Orthopsychiat.*, 1937, vol. vii, part 4).

Also a pamphlet by C. H. Rogerson (*Play Therapy in Childhood*, Oxford Medical Publications, 1939) discusses the value of this method used on a number of highly selected cases in which no interpretation was given.

J. Louise Espert, *Children's Emotional Problems* (State Hospitals' Press, 1938), Part 5, "The Playroom," describes the use of a play room in a hospital for mentally ill children where play is valuable as a means of motor expression and affective abreaction and as a means of obtaining information about the child. The equipment is given.

Specialized Tools.

1. *Art.*—(*a*) The earliest example of the use of drawings with children is in a paper by Kenneth E. Appel, "Drawing of Children as Aids to Personality Studies" (*Am. J. Orthopsychiat.*, 1930–31, vol. xi, part 2). He starts with blots which lead to drawings of home, parents and siblings, then dramatized drawings of three wishes, money bags and dreams and the use of magical power. A number of reproductions of drawings are given.

(*b*) *Finger Painting*, by Ruth Faison Shaw (publ. New York, 1936). Using paste paint and wet glossy paper, Miss Shaw allowed children in her school to manipulate this material with fingers and hands, using the widest range of bodily movements to produce any result they wished. She found that some children reproduced their fears and fantasies and would gradually talk about them and their difficult home situations. Through her great sympathy with children and her keen intuition she was able to adjust many children's problems by using this easy plastic medium. Her work is remarkable for delicacy of handling and very real understanding.

(*c*) "Child Art as an Aid to Diagnosis of Juvenile Neurosis," Ernest Harms (*Am. J. Orthopsychiat.*, 1941, vol. xi, part 2). This is a detailed description of a very interesting method in which the writer makes use of the theories of Freud, Jung and Adler, and which he advises should not be used by anyone who has not been trained in its use. First the child is asked to do abstract or contentless art, using only colour and form. He is asked to express words by lines. Secondly, he is given words with an emotional content to depict. Thirdly, he is asked to paint in a realistic way what has occupied him most during stage 2, or he is told to rest and then paint his first thought, or what he fears most, or a recent dream. Many photographs of the drawings are reproduced with details about the children. The writer discusses the different meaning the symbols have for children and adults.

(*d*) "The Analysis and Treatment of a Case of Neurotic Conduct Disorder in a

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Young Child. Illustrating the Value and Use of Drawings in Child Guidance Technique," H. Edelston (*J. Ment. Sci.*, 1939). The author maintains that drawings are particularly valuable to describe complicated and confused mental processes for which words are inadequate. A case is reported of a girl, aged 7¼, referred for troublesome behaviour in which drawings are mainly described.

(*e*) " Clinical Application of a Test of Imagination to Neurotic Children," Eva R. Blake and Adrian H. Vender Veer (*Am. J. Orthopsychiat.*, 1942, vol. xii, part 1). The test material consisted of " twelve pictures suggesting conflictual situations to which a variety of fantasies could readily be associated." They were presented to 40 children between the ages of 5½ and 15, I.Q. 82 to 150. The children were told to tell a story with the picture as a basis. Many examples of the stories are given along with details about the child. It is useful as an aid to diagnosis.

(*f*) J. Louise Despert, *Children's Emotional Problems* (State Hospitals' Press, 1938), part 3, " Drawings."

In a hospital for mentally ill children drawings were done daily in the quiet hour after lunch. The difference between the drawings of neurotic and psychotic children are discussed with many illustrations.

(*g*) Drawing is one of the techniques mentioned in Edward Liss's paper below.

Puppetry.—" Finger Puppets and Mask Making as Media for Work with Children," R. L. Jenkins and Erica Backh (*Am. J. Orthopsychiat.*, 1942, vol. xii, part 2). The purpose of the paper as described by the authors is to present a description of the material, and its use to stimulate interest in the possibilities of these media for use in individual treatment. A highly interesting development of puppetry is given below in Group Play.

Plastic material.—(*a*) " The Use of Plastic Material as Psychiatric Approach to the Emotional Problems of Children," Lauretta Bender and Adolf Woltman (*Am. J. Orthopsychiat.*, 1937, vol. vii, part 3). This is a fascinating paper describing plasticine models made by children illustrated by photographs. The symbolic meaning of the models is discussed. The authors maintain that this material is more valuable than drawing because of its three-dimensional qualities. The work was done in a group.

(*b*) J. Louise Despert, *Children's Emotional Problems* (State Hospitals' Press, 1938), Part 2, " Using a Knife under Certain Definite Conditions." By means of a knife children reduce cardboard to fine pieces and thus relieve aggressive impulses. By the addition of water and glue these same pieces can be made into modelling material and used creatively.

"Worlds."—" The World Pictures of Children : A Method of Recording and Studying them," Margaret Lowenfeld (*Brit. J. Med. Psychol.*, 1939, vol. xviii, part 1). This is a report of some of the main features brought out in the play of children and adolescents by the use of three-dimensional material already described in the writer's book, *Play in Childhood.* A discussion of twenty worlds with reproductions is given, and a discussion at the end of the paper brings out the comparison between the underlying assumptions of this piece of technique and other forms of technique used in therapeutic play.

" Treatment of Emotional Problems in Childhood," W. H. Whiles (*J. Ment. Sci.*, 1941, vol. lxxxvii, p. 359). The work was done in an ordinary psychotherapeutic outpatient department, in a playroom equipped with various toys. The main piece of apparatus used was Lowenfeld's " worlds," on whose method the work was based. The technique is illustrated by one full case of a boy, aged 8, referred for lack of energy and interest in anything varied by bouts of excitable behaviour. Diagrams are given of very interesting " worlds." No direct interpretation of symbolic play was given, but the child was talked to in his own symbolic language, e.g. there was a discussion on the dangers of floods, and he was asked what other adventures the lamb had. The writer discusses the fact that sometimes children show resistance; a period full of fantasy will be followed by a dull period of reality play. If the child sticks to reality play, then, the writer maintains, no further advance can be expected from play therapy.

Ordinary office equipment.—" Use of Ordinary Office Equipment in Play Therapy," M. B. Durfee (*Am. J. Orthopsychiat.*, 1942, vol. xii, part 3). The typewriter, telephone and dictaphone were found to be of great use, particularly the last. The method was used on children of 10 years and over. The questions and answers in the interview were recorded on the dictaphone, and stories told into it

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by the children and the therapist. The dictaphone provides an objective record of what has been said; the child hearing it often makes comments on what has been said.

Microphone.—" Treatment of Fearful Children," Jacob Conn (*Am. J. Orthopsychiat.*, 1941, vol. xi, part 4). The writer discusses a play interview method to supplement other investigations. The child is set before a toy house in which a microphone is concealed; the opportunity is given to the child to speak for a number of dolls and thus reveal thoughts and fears.

Story forms.—(*a*) " Play Technique in Child Analysis," Edward Liss (*Am. J. Orthopsychiat.*, 1936, vol. vi, part 1). Experience in a modern progressive school led the writer to the conclusion that play material used was too limited. He describes with examples three pieces of technique: the use of dramatization through puppets; drawings and rhymes; literary forms. He stresses the fact that as well as the analytic there is also the synthetic element in play.

(*b*) *Emotional Problems in Children*, J. Louise Despert (State Hospitals' Press, 1938), part 1, " The Story : a Form of Directed Fantasy," consists of the reproduction by children of popular stories, or stories told by teacher, or stories made up by the children on a theme given by physician.

Bricks.—" Configuration in Play," by Erik Homburger (*Psychoanal. Quart.*, 1937). In an extremely interesting paper the writer points out that spatial configurations are the important characteristics which differentiate psychological material obtained through play from that communicated by words. He suggests that further deciphering of play hieroglyphics may offer valuable help for the understanding of the prelinguistic and alinguistic strata of the mind. He gives five very interesting examples of children from 4 to 12 in which ideas of the body are shown in the architecture of houses built with bricks. Other examples are given of the use of play and of the play constructions of college students.

The writer has also written " Studies in the Interpretation of Play: Clinical Observations of Play Disruption in Young Children " (*Genetic Psychology Monographs*, 1940, vol. xxii, No. 4). This is a long, intricate and very interesting treatise which it is impossible to summarize, in which the writer continues the arguments begun in " Configuration in Play."

Group methods.—No attempt is made to deal with material describing socializing group play.

1. *Methods used in children's wards of mental hospitals.*—(*a*) " Use of Puppet Shows as a Psychotherapeutic Method for Behaviour Problems in Children." Lauretta Bender and Adolf Woltmann (*Am. J. Orthopsychiat.*, 1936, vol. vi, part 3) devised a technique for the presenting of puppet shows to children of 2 to 16 years. All types of problems are represented, but the majority are behaviour difficulties. The giving of puppet shows on which the audience commented freely and helped to find solutions to the situations presented was found to be of great value both in itself, and as a basis for further discussion with the psychiatrist. Classes in which puppets were made and plays invented were also held. The writers discuss the meaning the different characters, real and fantastic, have for the children, and their reactions to the plays. Another paper by Lauretta Bender (" Group Activities in a Children's Ward as a Method of Psychotherapy," *Am. J. Psychiat.*, 1937) includes also music, art and play activities.

(*b*) " Drama as a Therapeutic Measure in Adolescents," Frank J. Curran (*Am. J. Orthopsychiat.*, 1939, vol. ix, part 1). The writer in a similar situation used drama with boys of 12 to 16. The boys wrote and acted their own plays, which were discussed after the performance. Boys who, from the evidence of the plays, had the same difficulties were seen alone together and asked how they came to write the plays. Several examples are given.

J. Louise Despert: *Children's Emotional Problems: Collective Fantasy*, part 4 (State Hospitals' Press, 1938). Between supper and bed-time a group of boys were given the theme of the building of a sky-scraper about which they were asked to fantasy. A group of girls chose as their theme, Xmas. The fantasies were elaborated by the children and took many forms of expression, such as words, gestures, drawings, drama, etc.

In clinic.—Finally of particular interest in reference to the method of play considered in this paper is a contribution by Betty Gabriel, " An Experiment in Group Treatment " (*Am. J. Orthopsychiat.*, 1939, vol. ix, part 1). Six boys and

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girls, aged 9 to 11, would turn up at the clinic without appointments during individual sessions. The idea of a group was welcomed. The therapist sat aloof and the children knew that she took notes. She interpreted when necessary either before the others or apart; they were also given individual treatment. The winter sessions are given in detail and are very interesting. In 1931 appeared Margaret Lowenfeld's paper " A New Approach to the Problem of Psycho-neurosis in Childhood " (*Brit. Journ. Med. Psychol.*, vol. viii, part 3). Working in pediatrics at the consultation school children's centre of the Marylebone Dispensary, the writer found an unexpected response by children to the use of play materials and in 1928 decided to experiment. In the paper the results are described of a combination of group and individual play very similar to that described by Betty Gabriel. The play room is described and the method illustrated by extracts from the play of three boys and three girls, aged 3 to 11, all referred for physical symptoms. The play was spontaneous, but played out in the presence of an adult. At this time very little direct explanation of play was given to the children.

1935: *Play in Childhood*, by Margaret Lowenfeld. This book does not deal with therapeutic play, but is an account of the forms of play shown by normal children. Mention is included here only because much of the illustrative material was drawn from records of children at the I.C.P. and gives useful accounts for reference of the use of the specialized instruments, such as " worlds," etc., developed in the Institute of Child Psychology.

Summary.

1. A short account has been given of the reasons why children naturally express themselves through play and the use that is made of this form of expression.

2. The function of the therapist in the Lowenfeld technique has been described and the manner in which explanation of his play is given.

3. A description has been given of the routine technical procedure used in the Lowenfeld technique and at the Clinic and Playroom in Birmingham, where a demonstration of the use of the technique in a Child Guidance Clinic was carried out.

4. An account has been given of five cases treated by the Lowenfeld technique and the immediate and remote results obtained.

5. A classification of the literature on Play Technique in England and America has been attempted.

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CLINICAL AND BIOCHEMICAL ANALYSIS OF A CASE OF MANIC-DEPRESSIVE PSYCHOSIS SHOWING REGULAR WEEKLY CYCLES.

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[Received July 18, 1944.]

THE unfailing regularity of the rhythm of his manic-depressive cycles each week renders the patient in question particularly suitable for investigation, and throws into relief changes which might be less marked if the transition between the phases was more gradual and the periodicity less certain.

Clinical observations continued over a number of months had shown a period of five days of depression, followed by two of mania, and it was decided to undertake parallel clinical and biochemical investigations to ascertain if there existed any metabolic change coincidental with variations in his mental state.

History.—The patient (H. L—) commenced his career as a tradesman, and later became a clergyman. His brother described him as being of a cheerful disposition, and a companionable man who liked to make friends. From an early age he showed an inclination to religious work, and was fond of public speaking.

In 1928, at the age of 51 and after 16 years' successful ministry, he suddenly became depressed, complained continuously of internal trouble, and was obsessed with the idea that he might have a " formation " in the stomach. In this condition he was admitted to hospital in March, 1929, remaining here until March, 1930, and during this time he was continuously depressed. Although still depressed, he was discharged at the request of his relatives and went to live at a country residence, where he remained for a period of nine years in a similar state, although his brother reported that the depression may have been less marked on some days than on others. After that he went to live with his brother elsewhere, and apparently showed no change mentally until April, 1942, when his wife died.

It was shortly after her death that this continuous depression was broken each week by two days of excitement and overactivity. When the change first occurred the days of mania were Tuesday and Wednesday, and gradually shifted until they occurred on Saturday and Sunday. During the manic episodes he was irritable, made himself a nuisance by forcing his company upon his friends and relatives, and squandered his money, e.g., on unnecessary purchases and generous gifts. He attracted attention by his extravagant and bizarre behaviour ; for instance, on one occasion he entered a milliner's shop, kissed the shop assistants, put on a number of ladies' hats, and walked out with them. He also gave cinema tickets with religious texts on them to soldiers. Throughout these periods of mania he was sleepless and noisy. In 1943 he was readmitted to this hospital.

The family history shows that his father's mother died in a mental hospital, and that his twin sister died at the end of two years in a mental hospital at the age of 36.

Clinical.—Since his readmission his weekly cycle has been maintained with almost absolute regularity up to the present, apart from the fact that within the last few weeks the manic phase has been about one day earlier than previously, i.e., whereas before the manic phase began to appear on Saturday morning and to disappear into the melancholic phase on the following evening or on Monday morning, latterly it has begun to show itself on Friday morning and to wane on Sunday morning.

The depressive condition usually starts with a decrease of activity ; he withdraws from the company of the ward, and ceases to speak of his own accord,

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although when addressed he will talk readily. At the same time his voice undergoes a change, becoming weaker, more high-pitched and plaintive. He becomes gradually less and less active, and sits or lies about with no desire to occupy himself. Within the next twenty-four hours the depression deepens slowly until it reaches its maximum level. He remains thus for the next four days, until he begins the reascent into the manic phase. During these four days of deep depression he is almost motionless, though never stuporose, has an expression of great unhappiness, never speaks spontaneously, and answers questions with reluctance. When questioned he complains of general debility, of vague pains in the abdomen, or of fatigue. However, he sleeps well at night. During this phase he has to be prompted to empty his bowel and bladder.

The onset of the manic condition is also gradual and takes about twelve hours to reach its height. The first sign of the change is an increase in activity and he nearly always begins to read and write. He answers questions more readily, but his voice is still weak and his expression is worried. In about two to four hours he becomes more active and more talkative. His voice becomes clear and strong. He becomes hyperactive, which takes the form of walking about the ward, talking and arguing with other patients. He becomes boastful, makes complaints, writes numerous letters in great haste, some of which are in verse. After this transition period of ten to twelve hours, the peak of the manic condition is maintained for about twenty hours and during it he is very elated, accessible and amenable to reason, although restless and seeking to attract attention. In the manic state he never sleeps more than one or two hours at night and usually not at all, but is as active throughout the night as during the day.

The change in his voice noted above is an unfailing indication of the transition from elation to depression. Towards the end of the manic phase his voice becomes weaker, plaintive, and more highly pitched, and this heralds emotional features premonitory to the descent into depression. It retains these qualities until the end of the melancholic phase and on into the early part of the succeeding ascent, when the timbre and character of his voice improve.

Physical examination.—He is of pyknic type. During the depressed phase his appearance of general physical well-being contrasts sharply with his complaint of fatigue, vague pains all over his body, and widespread discomfort. Whereas during the depressive phase his colour is good and he looks well generally, in the manic phase he looks older, drawn, and sallow.

At no stage, however, has physical examination revealed any specific abnormality. The pulse rate is about 58 in the depression, and changes to about 80 in the manic state, and similarly the blood pressure varies from 100/56 to 150/82. His pupils are somewhat small, but react to light and convergence, and the most exhaustive neurological examination has revealed no abormality. The blood Wassermann is negative.

The urine is free from albumin and sugar, and there is no prostatic enlargement.

Experimental procedure.—Throughout the biochemical examinations lasting seven months, the patient was kept rigidly to a constant mixed diet. This consisted of a daily ration of 4 oz. lean beef, 2 oz. cheese, 1 lb. potatoes, 1 egg, 2 oz. margarine, 1 pint milk with a teaspoonful of cocoa and sugar, 2 apples, 2 oz. rice, 2 oz. cabbage, 8 oz. beetroot, 4 oz. bread, and ½ pint water. The food was weighed and the fluid measured carefully. He was encouraged to take everything offered, and fortunately proved to be very co-operative.

The urine was collected under 5 c.c. of toluene in two twelve-hourly specimens each day, and was stored in the ice chest. At the beginning there was difficulty in getting exact collections owing to his tendency (already mentioned) to suppress his excretory functions, and if left to his own devices in the depressive phase, he would refrain from passing urine for more than thirty hours. Finally, however, he was trained to empty his bladder regularly, so that specimens were usually available for examination.

His mental state was recorded daily, and the blood pressure was taken each morning. During the transition periods this procedure gave place to two-hourly recordings of his mental state, blood pressure, pulse and respiration rates, and of his temperature.

In the period when biochemical investigations were being carried out he was

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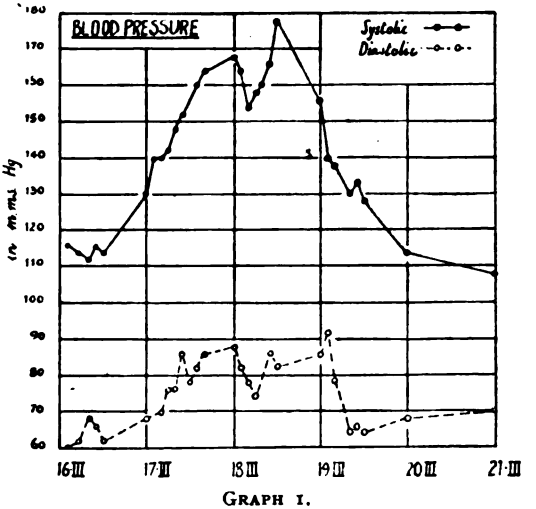
confined to bed. During this time he suffered no acute illness, and no drugs were administered. Biochemical estimations of certain constituents of the blood and urine were made daily for three weeks, and those which showed variations corresponding with changes in his mental condition were chosen for daily assay over a longer period. The estimations on the urine were conducted on each twelve-hourly sample, and also on the twenty-four hourly sample prepared by mixing aliquot parts of the two twelve-hourly ones. This procedure provided a check in duplicate. The methods employed in this investigation were: Chlorides, Volhard-Arnold method, Hawk's *Physiological Chemistry*, 1938, p. 768; total nitrogen, Kjeldahl, Hawk's *Physiological Chemistry*, 1938, p. 701; ammonia and urea, Van Slyke, D. D., and Cullen, G. E., *J. Biol. Chem.*, 1916, **24**, 117; calcium, Shohl, A. T., and Pedley, F. G., *J. Biol. Chem.*, 1922, **50**, 537; phosphates, Fiske, C. H., and Subbarow, Y., *J. Biol. Chem.*, 1925, **66**, 375; total phosphorus, Berenblum, I., and Chain, E., *Biochem. J.*, 1938, **32**, 295; sodium, *J. Assoc. Off. Agric. Chem.*, 1942, **25**, 429; creatinine, Folin, O., and Wu, H., *J. Biol. Chem.*, 1919, **38**, 81. The methods employed for blood investigations were: Non-protein nitrogen, Koch-McMeekin, *J. Amer. Chem. Soc.*, 1923, **46**, 2066; urea, Harrison, *Chemical Methods in Clinical Medicine*, 1937, p. 80; sugar, Harrison, *Chemical Methods in Clinical Medicine*, 1937, p. 144; chlorides, *Spec. Rep. Ser. M.R.C.*, No. 187, 1933; calcium, Clark, E. P., and Collip, J. B., *J. Biol. Chem.*, 1921, **63**, 461; phosphorus, Berenblum, I., and Chain, E., *Biochem. J.*, 1938, **32**, 295; creatine, Hawk's *Physiological Chemistry*, 1938, p. 426.

Blood Pressure, Pulse and Respiration Rates, and Body Weight.

The blood pressure and pulse rate showed pronounced variations, and it can be seen from a representative three-week period in Graph 4 below that these changes were related to the two phases. In the depression the blood-pressure readings were usually between 100/60 and 110/70 mm. Hg. During the manic phases the values rose to between 140/78 and 150/84, though systolic pressures up to 180 and over were occasionally observed. As a rule, the rise in the blood pressure seemed to be proportionate to the degree of activity and elation.



GRAPH 1.

The respiratory rate varied from 16 per minute in his depression to 20 per minute in his mania.

During the depression he gradually gained two or three pounds in weight, but the increase was lost again during mania.

Basal metabolism.—The basal metabolism was estimated each day for three weeks, and on the days of mania the deviations from normal were about plus 30 per cent. These high results can be accounted for mainly by his restlessness and

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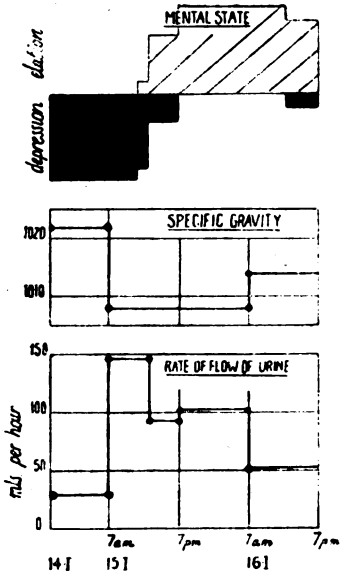
overactivity. During depression, when co-operation was difficult, the values were minus 10 to minus 15 per cent.

Biochemical Investigation of the Urine.

(A) *Cyclic Biochemical Fluctuations Associated with the Mental Periods.*

1. *Output of urine.*—As previously mentioned, the patient was kept on a constant diet and fluid intake. The daily total fluid contained in both food and drinks was 1,640 c.c. His weekly renal excretion was between 6,640 and 8,652 c.c. An average taken from nine weekly cycles showed a weekly output of 7,470 c.c. This was not excreted in equal amounts each day, but, as seen from the graph below, there was a striking difference in output in the depressive as compared with the manic state. Whereas the daily output in the former was about 780 c.c., in the latter for the first twenty-four hours it was almost always over 2,000 c.c. Taking an average of nine weeks, the output in the two days of mania amounted to 3,348 c.c., as against 3,894 c.c. for the five days of depression. Thus 44·8 per cent. of the entire weekly



GRAPH 2.

output was voided by the kidneys in the two days of mania. The specific gravity was also determined daily, and was found to vary indirectly with the volume. It was observed that the rate of flow of the urine markedly increased at about the time of the transition from depression to mania, and the time of the collection was accordingly altered to isolate a pure specimen of this " transition " urine. Eventually such specimens were obtained. On January 15, 1944, at 7 a.m. the patient was in typical deep depression, which continued until 11.30 a.m., at which time he began to show signs of change-over to the manic state. At 7 a.m. he passed 385 c.c. of urine of specific gravity 1022, this being the first time he had micturated for twelve hours, and representing a rate of renal excretion of 32 c.c. per hour. Seven and a half hours later, at 2.30 p.m., he again passed urine, and by this time he had been in the ascending mental state for three hours. On this latter occasion he passed 1,200 c.c. of urine, with a specific gravity of 1008, which would give a rate of renal excretion of 150 c.c. per hour, assuming that the flow had been at an even rate from 7 a.m. However, another possibility exists, i.e., the increase in flow was simultaneous with the first signs of the change-over in his mental state at 11.30 a.m., in which case, supposing that the rate of flow up to 11.30 a.m. was maintained at approximately 32 c.c. per average of the earlier specimen, the rate

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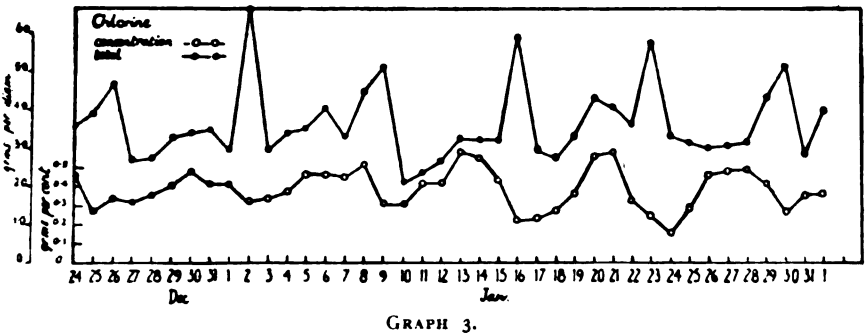
of flow subsequent to 11.30 a.m. must have been 350 c.c. per hour. The rate of flow after 2.30 p.m., however, fell to 98 c.c. per hour, and even at the peak of mania it never rose above 102 c.c. per hour.

Again at 7 a.m. on December 24, 1943, it was recorded that the patient for the previous 12 hours had been excreting urine at an average rate of 26 c.c. per hour. At noon he exhibited the first signs of the change-over to mania, and also passed 500 c.c. of urine, which represents an average rate of renal excretion of 100 c.c. per hour. The mania was only fully developed by 4.30 p.m. In this instance it is clear that the diuresis started whilst the patient was still depressed. It is also interesting to note that the blood pressure in this case was 108/64 mm. Hg at 9.15 a.m., and rose to 136/78 mm. Hg by 4.45 p.m. These facts, together with the consideration that the fluid must have first been mobilized from the tissues into the bloodstream before being excreted by the kidneys, shows that the diuresis preceded the first discernible signs of mania (see Graph 2).

2. *Chlorides.*—The patient was on a diet of constant chloride content, and the amount excreted in the urine was estimated each day for ten weeks. With one exception, the concentration of chloride in the urine was maintained at a fairly constant level from day to day, so that in the depressive state the chloride excretion was relatively low, and rose to a maximum with the increased urine output in the mania. The total weekly renal excretion of chloride varied only slightly from week to week, and in the two days of increased urinary output the chlorides passed



GRAPH 3.

out were about 15·6 gm. (expressed as sodium chloride), which represents about 33·8 per cent. of the weekly total of 46·7 gm. sodium chloride. The daily amount of chloride excreted during the depression was between 5–6 gm., whilst during mania the value was 8–10 gm. It can also be seen in Graph 4 that the lowest valuef or the chlorides always occurred in the twenty-four hours in which the patient changed from the manic to the depressive state.

The small amount excreted on these occasions was about 4 gm. In contrast to this constant low weight of chloride, the volume of urine in which it was contained varied considerably. For example (see Graph 3), on January 24, 1944, there was a relatively large volume of 1,480 c.c., which was 700 c.c. in excess of the average for the depression. Hence this urine had a very low chloride concentration, i.e., under ·2 gm. NaCl per cent. On the other hand, the specimen passed on March 6, 1944, had a volume of 715 c.c., which resulted in a much higher concentration of chloride, i.e., 1·58 gm. NaCl per cent. From this it seems that after the mania the body conserves its chlorides. The need for this appears to be great, for irrespective of the volume of water passed, the chloride output invariably remains at the constant low level of about 4 gm. NaCl.

Furthermore, during the depression the amount of chloride excreted and its concentration were higher in the daytime, and this holds true for the normal individual. In the mania, however, when he was sleepless and alert throughout the twenty-four hours, the amount of chloride and the concentration at which it was excreted were higher at night.

3. *Sodium and potassium.*—The amount of sodium excreted daily showed similar variations to that of the chlorides (see Graph 4), which points to a loss of the chief extracellular electrolyte of the body fluid.

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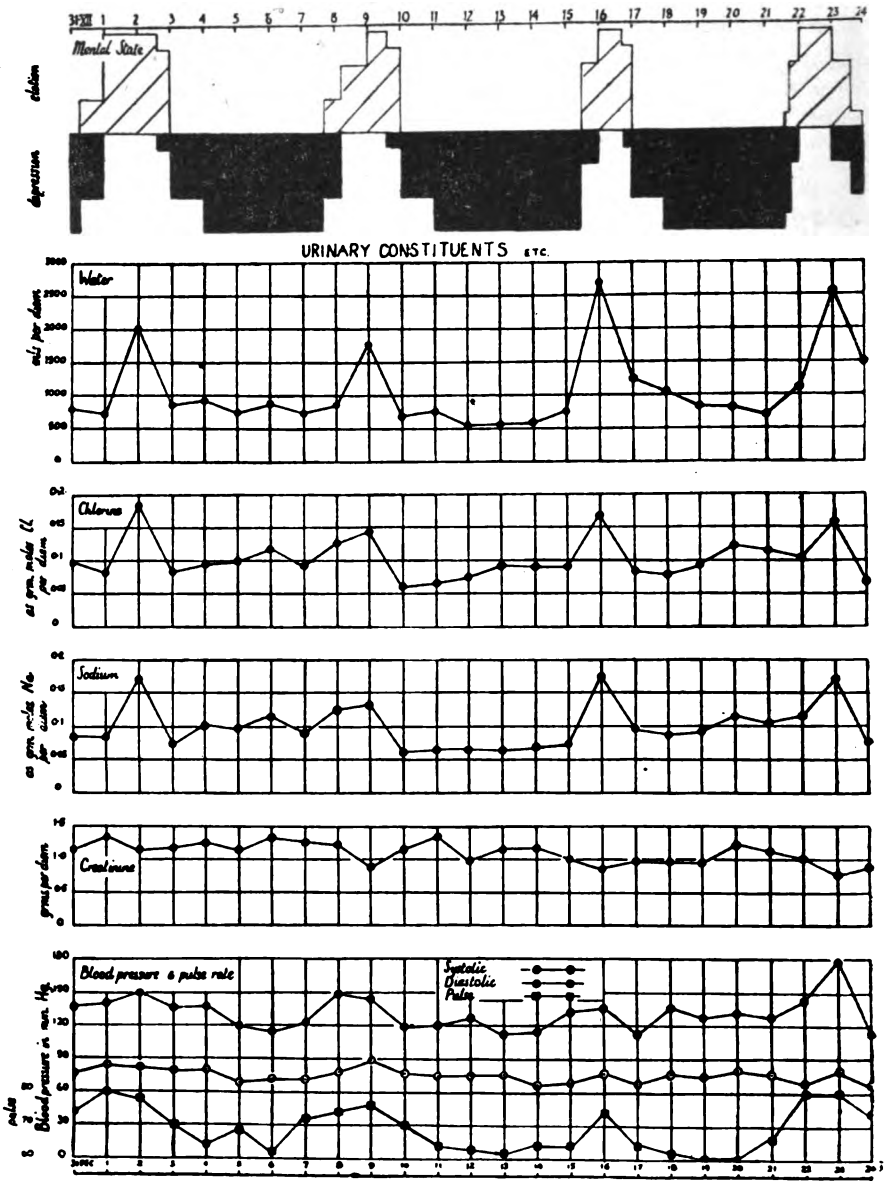
The potassium, however, was independent of the water and chloride passed, and was unrelated to the metabolic fluctuations described previously.

4. *Creatinine.*—The creatinine output (see Graph 4) was usually between 900



GRAPH 4.

and 1,000 mgm. each day, and showed a regular drop on the first day of his excessive urinary output. The amount excreted on these days was about 600 mgm., which was a deviation from his usual output by about 300 mgm. Special care was taken to ensure that the total volume of urine was collected, and it was certain that these low values could in no way be attributed to incomplete collection. This fall,

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TABLE I.—*Showing the Total Daily Amounts of Various Constituents Excreted in the Urine.*

Date.	Total nitrogen in gms.	Total calcium in mgms.	Total acidity, c.c's. N/10NaOH.	Total phosphates in mgms. P.
2.iii.44	—	316	—	857
3.iii.44	—	—	—	—
4.iii.44	—	**276**	—	**702**
5.iii.44	—	**299**	—	**787**
6.iii.44	—	292	—	790
7.iii.44	11·8	353	—	881
8.iii.44	9·5	352	355	691
9.iii.44	10·2	308	338	—
10.iii.44	9·4	308	412	680
11.iii.44	**10·5**	**284**	**881**	**545**
12.iii.44	**11·0**	**267**	**856**	**587**
13.iii.44	10·5	244	363	702
14.iii.44	9·8	320	420	306
15.iii.44	9·7	129	369	761
16.iii.44	10·7	243	277	609
17.iii.44	10·3	291	450	650
18.iii.44	**10·8**	**209**	**848**	**586**
19.iii.44	**11·0**	**192**	**857**	**691**
20.iii.44	9·8	192	339	720
21.iii.44	9·7	202	402	580

TABLE II.—*Showing the Daily Values of the Blood Pressure and Pulse and Respiration.*

Date.	Blood pressure. Diastolic, mm. Hg.	Blood pressure. Systolic, mm. Hg.	Pulse, per minute.	Respirations, per minute.
31.xii.43	74	138	74	20
1.i.44	**84**	**140**	**80**	**20**
2.i.44	**82**	**150**	**78**	**20**
3.i.44	78	136	70	18
4.i.44	80	138	64	20
5.i.44	68	120	69	18
6.i.44	72	114	62	18
7.i.44	72	122	72	18
8.i.44	**78**	**148**	**74**	**20**
9.i.44	**86**	**144**	**76**	**20**
10.i.44	76	118	70	20
11.i.44	74	120	64	18
12.i.44	74	126	63	18
13.i.44	74	112	62	18
14.i.44	66	114	64	18
15.i.44	**68**	**132**	**64**	**20**
16.i.44	**78**	**136**	**74**	**20**
17.i.44	68	114	64	18
18.i.44	78	136	62	18
19.i.44	74	128	61	16
20.i.44	80	132	61	18
21.i.44	74	128	66	18
22.i.44	**68**	**144**	**80**	**20**
23.i.44	**80**	**180**	**80**	**20**
24.i.44	66	114	74	20

moreover, was peculiar to creatinine, and was not exhibited by any other urinary constituent.

(B) *Urinary Constituents showing No Variation in Relation to the Mental Cycle.*

These results are given in the appended tables. They show all the substances estimated during cycles of different periods. It is seen that the values for pH

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TABLE III.—*Showing the Concentration of Various Constituents in the Blood Each Day.*

Date.	Serum chlorides, mgm.% $NaCl_2$.	Non-protein nitrogen, mgm.%.	Urea nitrogen, mgm.%.	Alkali reserve, c.c. CO_2%.	Creatine, mgm.%.	Total phosphorus in mgms.% P.	Haemoglobin, Sahli.	Sugar in mgms.%.	Calcium in mgms.% Ca.
11.viii.43	—	—	—	—	—	—	—	76	9·3
12.viii.43	—	—	—	—	—	—	—	101	9·3
13.viii.43	—	—	—	—	—	—	—	75	9·8
14.viii.43	—	—	—	—	—	—	—	**64**	**10·0**
15.viii.43	—	—	—	—	—	—	—	**91**	**10·4**
16.viii.43	—	—	—	—	—	—	—	108	9·8
17.viii.43	—	—	—	—	—	—	—	68	11·1
18.viii.43	—	—	—	—	—	—	—	90	10·9
15.xi.43	359	33·2	14·3	58·4	5·9	36	106	—	—
16.xi.43	342	25·2	14·1	59·4	4·1	28	100	—	—
17.xi.43	352	25·9	13·2	57·4	4·5	29	102	—	—
18.xi.43	360	35·0	13·8	54·2	7·3	—	108	—	—
19.xi.43	358	40·4	15·1	61·3	8·7	40	109	—	—
20.xi.43	**372**	**36·0**	**16·5**	**60·2**	**5·9**	**28**	**105**	—	—
21.xi.43	**360**	**33·7**	**15·7**	**59·5**	**6·1**	**24**	**107**	—	—
22.xi.43	372	33·6	15·9	57	7·1	30	104	—	—
23.xi.43	353	33·2	15·4	61·3	5·1	35	106	—	—
24.xi.43	340	38·8	12·5	56·7	6·2	48	102	—	—
25.xi.43	357	35·0	15·7	61·4	6·8	40	106	—	—
26.xi.43	362	41·6	15·3	—	6·1	36	103	—	—
27.xi.43	**359**	**32·3**	**14·4**	—	**4·6**	**32**	**106**	—	—
28.xi.43	**356**	**30·4**	**13·5**	—	**3·9**	**33**	**105**	—	—
29.xi.43	361	34·8	15·5	—	5·9	24	108	—	—
30.xi.43	362	35·6	16·7	—	5·2	—	106	—	—
1.xii.43	380	29·6	16·0	—	4·5	46	108	—	—
2.xii.43	378	36·1	16·2	—	4·7	33·5	104	—	—
3.xii.43	365	39·6	13·7	—	4·2	40	105	—	—
4.xii.43	**379**	**35·6**	**16·5**	—	**4·2**	**30**	**110**	—	—
5.xii.43	**364**	**33·5**	**12·7**	—	**5·8**	**39**	**107**	—	—

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TABLE IV.—*Showing Total Daily Amounts of Various Constituents Excreted in the Urine.*

Date.	Volume in c.c.	Total chlorine in gms.	Total sodium in gms.	Total creatinine in mgms.	Total potassium in gms.	Total nitrogen in gms.	Total urea nitrogen in gms.	Total phosphorus in mgms. P.	Total ammonia in mgms.
31.xii.43	800	3·52	1·98	1,136	1·30	11·1	8·6	644	256
1.1.44	**745**	**2·91**	**1·97**	**1,430**	**0·80**	**8·6**	**6·9**	**655**	**402**
2.1.44	**2,010**	**6·55**	**3·94**	**1,105**	**0·80**	**10·1**	**8·7**	**542**	**361**
3.i.44	850	2·91	1·66	1,173	1·05	9·3	7·9	1,710	331
4.i.44	905	3·40	2·33	1,240	1·21	10·2	8·2	805	398
5.i.44	750	3·52	2·28	1,125	1·3	11·0	9·8	780	405
6.i.44	885	4·12	2·68	1,318	1·06	15·5	13·5	1,000	380
7.i.44	730	3·27	2·06	1,284	0·98	11·6	9·7	674	394
8.1.44	**865**	**4·49**	**2·85**	**1,211**	**1·28**	**12·8**	**11·9**	**860**	**371**
9.1.44	**1,775**	**5·11**	**3·02**	**870**	**0·97**	**9·7**	**9·0**	**462**	**355**
10.i.44	690	2·13	1·40	1,124	1·15	10·4	9·4	729	408
11.i.44	760	2·30	1·47	1,358	0·91	12·3	11·2	808	—
12.i.44	535	2·61	1·44	950	0·51	9·8	8·6	753	—
13.i.44	565	3·27	1·41	1,152	0·75	9·9	9·2	734	—
14.i.44	575	3·21	1·55	1,198	0·74	10·5	9·1	736	—
15.1.44	**740**	**3·21**	**1·75**	**999**	**0·56**	**14·1**	**10·4**	**585**	—
16.1.44	**2,700**	**5·88**	**4·08**	**864**	**1·05**	**17·9**	**11·8**	**742**	—
17.i.44	1,210	2·92	2·19	968	1·06	10·0	7·9	1,110	—
18.i.44	1,050	2·79	2·02	966	0·81	9·2	7·5	1,108	—
19.i.44	805	3·33	2·08	942	0·80	10·0	9·3	578	—
20.i.44	800	4·37	2·64	1,224	0·84	11·8	10·9	380	—
21.i.44	700	4·06	2·38	1,106	1·10	10·6	8·9	788	—
22.1.44	**1,102**	**3·64**	**2·64**	**1,108**	—	**9·0**	**7·9**	**545**	—
23.1.44	**2,569**	**5·71**	**3·91**	**773**	**1·22**	**11·0**	**8·8**	**826**	—
24.i.44	1,480	2·43	1·72	888	1·19	9·8	9·2	—	—

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titratable acidity, calcium, potassium, ammonia, and phosphorus are all within normal limits. There are variations in calcium and phosphorus, but these bear no relation to the mental cycle. The daily values for nitrogen vary between 10 and 11 gm., of which about 90 per cent. are contributed by urea.

Biochemical Investigation of the Blood.

The difficulties associated with repeated venepuncture restricted a long serial examination of the blood. Specimens were examined daily for three consecutive weeks, and from the results obtained only non-protein nitrogen showed any variation in relation to the mental cycle. On the day before the excessive output of urine, the results of this estimation were consistently the highest for the week. The blood sugar, plasma chloride, serum calcium, total phosphates, erythrocytes, haematocrit and haemoglobin were within normal limits, and exhibited no periodic fluctuation.

Summary.

The patient under investigation, at the age of 51, became subject to a state of depression, which lasted for 14 years without complete remission. In 1942, at the age of 65, he developed weekly mental cycles in which he was in a depression for five days, followed by a manic state of two days. At first the mania appeared in the early part of the week, and gradually shifted to the week-end. When this investigation started the mania occurred every Saturday and Sunday, but lately it has appeared on Friday and Saturday. The transition from one phase to the other was characterized by a mixed state, showing both depressive and manic features. This patient belongs to a small group recognized by Kraepelin, which is characterized by the onset of depression in late middle age, changing in old age to a manic depressive cycle.

Closely correlated with his mental cycles are cyclic clinical and metabolic fluctuations. There was a definite rise in the blood pressure, pulse and respiratory rates, during the manic phase, and a corresponding fall during the depression. The basal metabolism estimated for three weeks was found to be plus 30 in the mania and about minus 10 during the depression.

There was a gain of 2 to 3 lb. in weight during the depression, and a corresponding weight loss during the manic phase. There was a regular diminution of creatinine in the twenty-four-hourly urine passed in the period during which the transition from depression to mania occurred, although the urinary volumes on these days were the highest for the week.

The most marked fluctuations found were those in the water, chloride, and sodium output in the urine. The water excretion for the two days of mania amounted to nearly half the weekly total, and the amounts of sodium and chloride were correspondingly high on these two days. There was, therefore, a cyclic metabolic fluctuation, which consisted of a retention of water and salt in the depressive phase, and a release of these in the manic phase. This means that the urinary constituents showing variation were probably derived from the extracellular body fluid.

Furthermore, it appears that a sudden rise in the flow of the urine started when the patient was still in his depression, and was maintained at this high rate during the opening stages of his mania. By the time the patient had reached his most excited state this rate had already decreased. Also, there appeared to be no connection between the excessive output of the urinary constituents and the rise in blood pressure, pulse and respiratory rates during these transitions.

Further investigations on this case are in process, and the results of these will be published later.

We are indebted to Dr. W. McCartan, Medical Superntendent, for his advice and encouragement throughout this investigation, and to Dr. L. R. Janes, Pathologist, Royal Sussex County Hospital, for the loan of apparatus. It also gives us great pleasure to acknowledge the help rendered by J. Hughes, Esq., R.M.N.

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PHYSIQUE AND EFFORT SYNDROME.

By W. Linford Rees, M.D., B.Sc., M.R.C.P., D.P.M.

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This paper describes an investigation into the significance of physique in effort syndrome.

The primary purpose of the investigation was to determine in what respects the body-build of effort syndrome patients as a group differed from the normal, and secondarily to determine the significance of physique in the development and form of the illness.

Numerous causative factors have been postulated to explain the pathogenesis of the condition since it was first described by Da Costa in 1877. It is possible to divide these into intrinsic (or constitutional) and extrinsic factors, the relative importance of which is found to vary considerably in different cases.

In some patients intrinsic factors are considered to be predominant, and it is customary to classify these under the term constitutional effort syndrome. These cases usually have a history of life-long effort intolerance or vegetative disequilibrium on exertion or excitement, and external factors seem to be relatively unimportant. The exact nature of the constitutional predisposition to effort syndrome is, however, not yet known.

It is possible to study constitution from many aspects, e.g. from the point of view of morphological, psychological, physiological, immunological characteristics. In this study the morphological aspect of human constitution is investigated, as physique lends itself more readily to exact measurement than other constitutional attributes.

Poor physical development had been noted in patients suffering from effort syndrome by Friedlander and Freyhof (1918), Swan (1921) and Wood (1941). The only work known to the writer in which measurements were used and evaluated statistically is that of Lewis (1941), who found that the mean Stromgren index of a group of effort syndrome patients did not differ significantly from that of a group of infantry soldiers.

In view of certain differences in skull and other measurements between the infantry group and data available on other normal groups of the British Isles, it was decided on Dr. A. J. Lewis's suggestion to extend the investigation, using a larger number of physical measurements on additional effort syndrome and normal control groups.

The Material.

The material consists of two groups of 100 soldiers who were successive admissions to the Effort Syndrome Unit of Mill Hill Emergency Hospital. The first group was measured in 1941 and the second in 1942. The lack of adequate anthropometric data on the population of the British Isles necessitated a corresponding anthropometric investigation on a group of 100 soldiers of comparable age and military status to the effort syndrome groups. The measurements of the control group showed little significant difference from the data available for the normal population (Cathcart *et al.*, 1935; Coon, 1939).

Technique.

The measurements were mainly taken by the technique described by Hrdlicka (1939); some measurements were taken by methods described by Martin (1928) and Wilder (1920). The following body-build indices were calculated:

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Stromgren's index = $-\cdot04$ Stature + $\cdot127$ transverse chest diameter + $\cdot156$ sagittal chest diameter.

Brugsch's index = $\frac{\text{Chest circumference} \times 100}{\text{Stature}}$

(In this work chest circumference at inspiration was used.)

Morphological index = $\frac{\text{Symphysis height} \times 10^3 \times 100}{\text{Trunk length} \times \text{sagittal chest diameter} \times \text{transverse chest diameter.}}$

Rees and Eysenck index = $\frac{\text{Stature} \times 100}{6 \times \text{Transverse chest diameter.}}$

Differences in physique may be due to body size or to bodily proportion or physical type. Differences in size will be shown by the absolute measurements, and differences in physical type by body-build indices.

The distribution of physical types in the groups was determined objectively by means of the Stromgren index. The criteria laid down by Stromgren (1937) were found to be unsatisfactory, as they are based on the assumption that the majority of individuals can be divided into leptosomatic and pyknic types. Experience of the writer in anthropometric work on over 1,000 individuals refutes this—the majority of individuals were found to be of intermediate physique. The normal group was classified by inspection into physical types and the following distribution was found :

Leptosomes 23 per cent. Intermediate 53 per cent. Pyknic 24 per cent.

Using the criteria laid down by Stromgren there was little agreement in the distribution of physical types, but if the values of the 24th and 77th percentiles (corresponding to above distribution) of the Stromgren index were taken as the arbitrary lines of demarcation between the types, there was very close agreement between body type detected by inspection and objectively by using these values of Stromgren's index. Thus Stromgren index values of $-0\cdot133$ (24th percentile) and higher were taken as indicating pyknic habitus and values of $-0\cdot79$ (77th percentile) and lower, a leptosomatic habitus, the intermediate type being distributed between these values. Using these ranges of the Stromgren index we have the following distribution of objectively determined physical types in the control group :

Leptosomes 21 per cent. Intermediate 58 per cent. Pyknic 21 per cent.

Results.

Statistical comparison of absolute measurements and indices of body-build in the effort syndrome and control groups is shown in the Table. The significance of the difference of the means was determined by the critical ratio technique.

From the Table it will be seen that the first group of 100 effort syndrome patients were significantly greater in the following length measurements : stature, suprasternal height and trunk length, and significantly smaller in the following breadth measurements : biacromial diameter, transverse and sagittal chest diameters, indicating a more linear or leptosomatic habitus than the control group.

This conclusion is confirmed by the significant differences in Stromgren and morphological indices, which also point to a more leptosomatic habitus in the effort syndrome group.

The second group of effort syndrome patients had additional measurements taken. Sternal length, hip circumference and weight, showed no significant differences. Chest circumference and chest expansion were significantly smaller in the effort syndrome group. The Pignet and Stromgren indices indicate that the second effort syndrome group is also significantly more leptosomatic in bodily habitus than the control group. The second group did not differ significantly in stature, suprasternal or symphysis height, trunk length or skull measurements. It was significantly smaller in sagittal chest diameter (critical ratio = 2·9).

Taking the total group of 200 effort syndrome patients, we find that both the Stromgren and Rees-Eysenck indices indicate that the group is significantly more

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TABLE I.

Variate.	Effort syndrome. Mean.	Effort syndrome. Standard deviation.	Control group. Mean.	Control group. Standard deviation.	Critical ratio.
1st 100.					
Age	28·16 ± 6·5833		29·27 ± 6·066		1·387
Stature	172·84 ± 6·6782		171·01 ± 5·3264		2·287
Suprasternal height	141·908 ± 5·435		139·47 ± 4·678		3·437
Symphysis height	85·85 ± 4·590		86·39 ± 4·5522		0·835
Breadth of skull	15·125 ± 0·511		15·275 ± 0·52		0·71
Length of skull	19·505 ± 0·6315		19·595 ± 0·208		0·937
Cephalic index	77·585 ± 3·146		77·905 ± 3·2832		0·686
Biacromial diameter	37·58 ± 1·9644		39·61 ± 2·1095		7·048
Transverse chest diameter	27·14 ± 1·7197		28·77 ± 2·1206		5·992
Sagittal chest diameter	19·838 ± 1·486		20·6 ± 1·633		3·454
Bicristal diameter	28·63 ± 1·663		29·08 ± 1·5978		1·953
Trunk length	55·492 ± 3·3116		53·41 ± 2·058		2·774
Stromgren index	−0·8805 ± 0·43116		−0·596 ± 0·4516		4·566
Morphological index	299·1 ± 45·70		285·85 ± 44·18		2·084
2nd 100.					
Sternal length	21·62 ± 1·4491		21·89 ± 2·2374		0·263
Chest circumference (insp.)	91·74 ± 4·2731		95·79 ± 4·8730		6·0
" " (exp.)	85·39 ± 3·9038		87·96 ± 5·3016		3·254
Chest expansion	5·31 ± 1·9236		7·95 ± 2·7054		6·449
Hip circumference	80·53 ± 3·406		79·93 ± 6·644		0·740
Weight (kg.)	64·89 ± 6·1098		65·6 ± 6·8876		0·21
Pignet index	13·2 ± 9·795		8·2 ± 12·1105		3·01
Brugsch index (chest insp.)	53·62 ± 2·1529		55·36 ± 3·133		4·3

leptosomatic than the control group (Stromgren index, Mean = −0·806, S.D. = 0·583, C.R. = 4·1; Rees-Eysenck index, Mean = 104·67; S.D. = 7·58, C.R. = 3·36).

It is interesting to note that the Effort Syndrome Group was also significantly more leptosomatic than a group of 400 neurotic soldiers admitted to Mill Hill Emergency Hospital (Rees-Eysenck index, Mean = 102·04, S.D. = 6·974, C.R. = 2·67).

The distribution of physical types determined objectively by Stromgren's index in the total group was: leptosomes 50 per cent., intermediate 44 per cent., pyknic 6 per cent. Thus the percentage of leptosomes is significantly higher than in the control group (critical ratio = 4·49). The correlation of the total group to leptosomatic body-build as measured by the biserial co-efficient of correlation is statistically significant (0·264 ± ·6625).

If the control group can be taken as a satisfactory sample of the general adult population, we conclude that the effort syndrome patients have a greater affinity to the leptosomatic type of physique than the average. This suggests but does not prove that leptosomatic habitus may be a factor in the genesis of effort syndrome.

It is therefore of interest to compare the type of illness in effort syndrome patients of leptosomatic physique with those of pyknic physique.

The following striking differences emerge: 85 per cent. of leptosomes had effort intolerance and vegetative disequilibrium from an early age, compared with 7 per cent. in the pyknic group.

Long-standing timidity, anxiety and general neuroticism was found in 66 per cent. of the leptosomes and only 36 per cent. of the pyknics.

Leptosomes also showed a higher incidence of unsatisfactory factors in the family history. Chronic hypochondriasis occurred in greater frequency in the leptosome group (37 per cent., compared with 14 per cent. of the pyknic group).

The effort syndrome patients of pyknic habitus were characterized by a comparatively short duration of illness—in 85 per cent. the onset was less than two years before admission, compared with 9 per cent. in the leptosome group. In 20 per cent. of the pyknic group the illness was precipitated by marked environmental stress (e.g. severe enemy action), and in 40 per cent. was precipitated by a febrile illness.

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Thus it is striking that in the leptosomes constitutional factors predominate as evidenced by family history, long-standing symptoms of effort intolerance, vegetative disequilibrium, hypochondriasis and neuroticism. The pyknics on the other hand tend to have effort intolerance of recent origin, which was often brought on by extrinsic factors, e.g. traumatic experiences or febrile illness.

Discussion.

Many causative factors can operate in the pathogenesis of effort syndrome as in other psychosomatic disorders. Body-build and its associated physiological and psychological characteristics are possible constitutional factors in the causation of the syndrome. Our results show that there is a statistically demonstrable affinity between effort syndrome and the leptosomatic type of physique.

Results of workers in other fields suggest that the physiological attributes of the leptosomatic type of body-build may play a role in the aetiology of effort syndrome.

Pende (1928) and Wiersma (1933) maintain that leptosomes are predominantly sympatheticotonic; vegetative disequilibrium in the form of sympathetic hyperactivity is found in the majority of effort syndrome patients.

The work of Seltzer (1940) may have some bearing on effort intolerance. Seltzer found that leptosomes have a lower degree of mechanical efficiency as measured by oxygen intake experiments than those of pyknic physique.

The evidence thus suggests that the leptosomatic habitus and its physiological attributes can be contributory factors in the development of effort syndrome. Confirmatory evidence of constitutional predisposition in effort syndrome patients of leptosomatic body-build is given by the family history and long-standing symptoms of effort intolerance, vegetative disequilibrium, hypochondriasis and general neuroticism. In the small proportion of effort syndrome patients who have a pyknic habitus, there is little evidence of constitutional predisposition, and the syndrome usually is produced by exogenous factors.

Summary.

(1) An anthropometric investigation of 200 soldiers suffering from effort syndrome revealed that the group as a whole was significantly more leptosomatic in body-build than a comparable control group.

(2) The proportion of leptosomes was significantly greater and the proportion of pyknics significantly smaller than in the normal group.

(3) Comparison of the aetiological factors in the leptosomatic and pyknic effort syndrome groups showed striking differences, indicating marked constitutional predisposition in the leptosomatic group as shown by family history, long-standing symptoms of effort intolerance, vegetative disequilibrium, hypochondriasis and general neuroticism. The pyknic group on the other hand showed little evidence of constitutional predisposition; the illness was usually of comparatively short duration and mainly determined by exogenous factors.

I wish to thank Dr. W. S. Maclay for permission to publish the case material, and Dr. A. J. Lewis for valuable advice.

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VESTIBULAR REACTIVITY TO CALORIC STIMULATION IN SCHIZOPHRENICS.

PRELIMINARY REPORT.

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ABNORMALITIES in the vestibular reactions in schizophrenics have been reported in the literature. Pekelsky (1921) observed transitory lack of caloric response in two cases of catatonic stupor. Rosenfeld (1926) described four cases of acute catatonia in which on calorization a slow deviation appeared instead of the physiological response. Claude, Baruk and Aubry (1927) examined four cases of catatonia, eight of hebephrenia and one of dementia paranoides. In one of the catatonic cases no caloric or galvanic response could be elicited, and in the three others the reactions were diminished. The other cases showed normal reactions. The authors stated that a diminution of the responses could sometimes be observed in hysteria. Claude, Bourguignon and Baruk (1932) found the chronaxie of the vestibular nerves greatly increased in patients with catalepsy, but normal after the disappearance of that symptom. Joo and Meduna (1935) stated that in old-standing cases of schizophrenia a lack or a considerable diminution of the vestibular responses could nearly always be found. Sercl and Vinar (1937) examined the vestibular reactivity in twelve cases of hebephrenia and thirteen cases of paranoid schizophrenia. The responses to rotation were normal in all cases. The caloric responses were found to be diminished or lacking. Lack of caloric response was more frequent in the hebephrenic than in the paranoid cases. Löwenbach (1936), working on Gjessing's cases of periodic catatonia, carried out quantitative investigations taking into account the latency period of nystagmus, its duration and the number of oscillations. He examined thirty cases, each of them repeatedly, and attempted to correlate the results of the tests with the periodical changes in the clinical picture. He found that shortly before and during periods of stupor the vestibular reactivity dropped, and that sometimes only a slow deviation could be elicited. The lowering of the frequency was due to the prolongation of the slow phase. The abnormalities were independent of the duration of the illness, and in some old-standing cases the response was normal. Sometimes a temporarily diminished reactivity was noticed which did not coincide with a change in the clinical picture. Löwenbach noted frequent and often abrupt changes in individual cases, and in some he observed transitory complete loss of reaction. Angyal and Blackman (1940) studied vestibular reactivity to caloric and rotatory stimulation in 58 unselected male schizophrenics and in 20 normal controls. The response to caloric stimulation was found to be considerably lowered, the rotatory response only slightly reduced. There was no correlation to the duration of hospitalization or to the conventional subtypes of schizophrenia. However, in a group of five patients with extreme apathy, indifference and poverty of mental contents the reactivity was particularly low. In cases with a periodical course the vestibular reactivity was distinctly lower during the catatonic periods than during the intervals. The same authors (1941) investigated the nystagmic reactions to caloric stimulation under the influence of alcohol, hyperpnoea and CO-inhalation in schizophrenics

* The vestibular examinations were carried out and recorded jointly by both authors, but owing to illness Dr. Fitzgerald could not take part in the writing of this article, for which I am alone responsible.—E. S.

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and normal persons. While in normals alcohol intake results in an increase in the frequency of the nystagmus, in schizophrenics a decrease was observed. CO, which normally has a depressing effect on the nystagmic reaction, produced an increase in schizophrenics. Hyperpnoea, while causing an increase in normals, had the opposite effect in schizophrenics. Freeman and Rodnick (1942) studied the amount of sway induced by rotation in thirty schizophrenics and in an equal number of normal controls. The patients were found to be significantly less reactive than the normal subjects.

The survey of the literature shows that there is some measure of agreement on one issue only, i.e., the occurrence of vestibular hypo-reactivity to caloric stimulation, but there is no agreement as to the consistency of this finding on schizophrenics in general, in certain types of cases and even in individual patients. The differences in the results of the various investigators may be partly due to the fact that some authors based their statements on a very small case-material the study of which did not permit of generalization, and partly due to the differences between the methods of examination employed. Rosenfeld, Pekelsky, Sercl and Vinar used gross caloric stimulation; Claude, Baruk and Aubry and other investigators used the Kobrak method in its original form or with some modification. As far as could be ascertained from the literature, none of the previous examiners tested and compared systematically the responses of both ears.

In examining the vestibular reactivity of schizophrenic patients, we have confined ourselves to the study of the caloric response in 50 unselected cases.

Technique of caloric testing employed.—We have adopted as most suitable for the purpose of this investigation a technique of calorization recently evolved by G. Fitzgerald and C. S. Hallpike (1942) at the National Hospital, London. This method is capable of revealing and measuring small differences in the caloric reactions of *both ears*, and avoids certain fallacies of the methods hitherto employed. We propose to give in this article only a short outline of the new method. For the details of the procedure and for the theoretical considerations on which that modification of Bárány's original technique was based the reader is referred to the original article (*Brain*, **65**, part 2, 115, 1942). Water at 30° and 44° C., flowing freely for 40 sec., provides the caloric stimulation. The nystagmus provoked is nearly always easy to observe, and hardly ever accompanied by nausea and severe vertigo. The observations were confined to nystagmus occurring in the straight ahead position ot fhe eyes. The time interval selected for measurement extends from the application of the stimulus to the end of the nystagmus. The selection of that time interval as a measure of nystagmus strength seemed justified from the viewpoint of both theory and technical facility, though the authors were aware that its description as " nystagmus duration " was wanting in accuracy. Though in this method attention is principally devoted to the duration of the nystagmic response, a general impression of its briskness is useful. Each subject requires four tests, with an interval between tests of at least five minutes. The results can be demonstrated in a convenient diagrammatic form (Fig. 1). In 80 per cent. of normal subjects the duration of the cold reactions varied between 90 and 130 seconds, with extremes in the remaining 20 per cent. of 80 to 160 seconds. In 80 per cent. of the normal subjects the cold reactions were in excess of the hot, usually by 5 to 15 seconds and with a maximum difference of 30 seconds. In 10 per cent. the cold and hot reactions were approximately equal, and in 10 per cent. the hot reactions exceeded the cold with a maximum difference of 15 seconds. In 80 per cent. the cold reaction of the two ears showed a difference of 5 seconds or less. In 10 per cent. this difference was 10 seconds, and 20–25 in the remaining 10 per cent. Differences of a similar order were observed in the hot reaction. No significant variations of the responses in normals were found. Certain changes in the mutual relationship of the four responses have been observed in association with well-attested lesions of the labyrinth and its central connections. They are clear-cut in type and of high diagnostic significance. As shown in Fig. 1, the four reactions take normally the form of a characteristic 4-element pattern, with the two cold reactions about equal and rather in excess of the two hot reactions, which again are roughly equal. Disturbance of this pattern under pathological conditions affecting the vestibular apparatus and its central connections was found to take one of three forms: (1) Disturbance in the relationship of the nystagmus-to-the-right reactions (Reactions 1 and 4) to the nystagmus-to-the-left reactions (Reactions 2 and 3).

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Disturbance of this type was called " directional preponderance " (Figs. 2 and 3). Fitzgerald and Hallpike (1942) found directional preponderance to the side of the

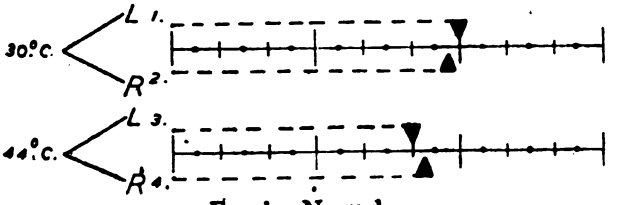

FIG. 1.—Normal.

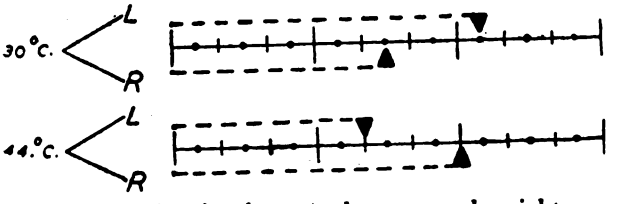

FIG. 2.—Directional preponderance to the right.

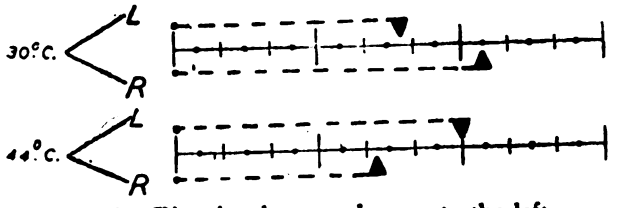

FIG. 3.—Directional preponderance to the left.

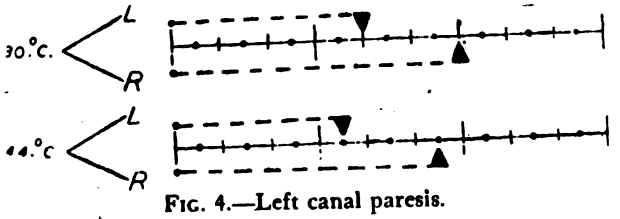

FIG. 4.—Left canal paresis.

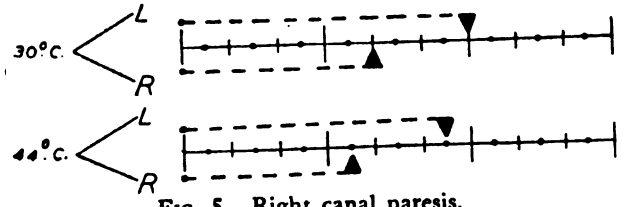

FIG. 5.—Right canal paresis.

lesion in ten cases of lesions localized within or involving the temporal lobe. (2) Disturbance in the relationship of the cold and hot reactions of the left ear (Reactions 1 and 3) to the cold and hot reactions of the right ear (Reactions 2 and 4). Disturbances of this type are due to " paresis " (i.e., impairment of response to stimulation) of the external semicircular canal of the ear exhibiting the lesser response (Fig. 4 and 5). (3) More complex changes in the reaction pattern which

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analysis has shown to arise from a variety of combinations of directional preponderance and "canal paresis."

Each continuous line represents a three-minute period, subdivided into intervals of minutes, 20 seconds and 10 seconds. The reactions of the left and right ears are denoted by L and R, while the stimulus time extends in all over the first 40 seconds. The interrupted line, - - - -, denotes the nystagmus duration. The reactions will be referred to in the text by the numbers 1, 2, 3 and 4 from above downwards as they appear in the diagrams (after Fitzgerald and Hallpike). These figures have been reproduced from the original article by those authors (*Brain*, 65, part 2, pp. 120, 122 and 123).

An examination such as that outlined above cannot be carried out against active opposition by the patient. At least passive co-operation is necessary. It was surprising how few of our schizophrenic patients resisted being examined. Those who did resist were either agitated and negativistic catatonics, or patients who out of their paranoid attitudes did not allow any interference. The usual attitude of the schizophrenic patients was one of indifference, which permitted of careful and undisturbed observation. In some cases the nystagmic response was accompanied by persistent blinking which made observation difficult. Such cases were excluded. A favourable feature in all patients was the lack of unpleasant sensations. This was partly due to the method, which employs only mild stimuli, partly due to the peculiarity that vertigo and nausea are only rarely experienced by schizophrenics as a result of calorization. Those sensations were absent even when gross thermal stimuli were employed. Each patient was examined twice. The second examination was carried out two to four weeks after the first one.

Case material.—In all of the 50 cases examined the diagnosis of a schizophrenic reaction type was beyond doubt. They ranged from cases in which the clinical symptoms were fairly recent, to others which had been in hospital for up to 18 years. Their ages ranged from 16 to 54. Each of the conventional subtypes of schizophrenic reactions was represented. In 18 cases the condition on admission had conformed to the picture of the reaction type of schizophrenia simplex, in 2 of hebephrenia, in 8 of catatonia, and in the remainder of paranoid schizophrenia and paraphrenia. The advance of the schizophrenic condition had naturally effaced those differences in many cases. In all patients a neurological examination had been found to be negative. In addition, an otological examination was carried out. Cases in which there was a suspicion of an ear affection were excluded. The tests were in every case preceded by careful cleaning of the external meatus.

Classification of the Responses Found on Examination of 50 Unselected Schizophrenic Patients.

Pattern A.—Response within normal limits.

Pattern B.—Lack or definite diminution of the response (duration under 90 seconds). We decided not to group separately cases which showed no response at all and those in which the response was subnormal. On very careful observation the majority of cases in which the response appeared at first to be completely lacking showed a few isolated fine oscillations.

Pattern C.—Under this category were grouped responses which showed a definite directional preponderance. Cr denotes preponderance to the right and Cl to the left.

Pattern D.—In a number of cases there was a marked difference between the reactions of both ears similar to that found in cases with a unilateral affection of the labyrinth. No clinical signs of such a lesion could be established in any of those patients. It is noteworthy that in some of those cases that abnormal type of response was not present on a second examination.

Pattern E.—While in normal subjects the cold responses are as a rule slightly in excess of the hot or equal, and in only 10 per cent. the hot reactions exceed the cold reactions with a maximum difference of 15 seconds, there was in our material a considerable number of responses with hot reactions far in excess of the cold. We have labelled those abnormal patterns as type E. Where that peculiarity coincided with one of the other abnormal features the response was labelled by the letter or the letters referring to them; e.g., a response characterized as Cl E was one in which there was directional preponderance to the left, and in which the sum total of the hot reactions exceeded that of the cold reactions very considerably.

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Borderline patterns.—In a number of cases the responses, though classifiable under one of the above categories, showed, in addition, slight features of one of the other types. We have classified them as borderline rather than as mixed responses, and have added to the letter denoting the main features of the response the symbol denoting the additional feature in brackets, e.g., a reaction pattern such as 135, 155, 155, 135 was classified as normal, as the difference did not exceed 20 seconds, but Cl was added in brackets, as there was a tendency to directional preponderance. A(B) would mean that the reaction, though still within normal limits, was on the low side, etc.

Special features.—Under that heading we noted certain peculiarities of the responses which deserved attention. We made a note of an unusually brisk or fine character of the oscillations. One of the more common features was a slow deviation into the direction of the slow component which accompanied the nystagmic reaction. In the cases which showed that feature it was not as a rule present in all four tests. Sometimes the deviation was more marked to one side than to the other, in some cases there was a deviation only into one direction, and in a few instances that deviation was the only response to thermal stimulation. There was never a deviation into the direction of the fast component. In some cases the duration of the nystagmus exceeded 160 seconds, which had been found to be the upper limit in normals. A special note was made when, though still within normal limits, the duration of the responses differed considerably in the two examinations.

Results.

Normal responses (*pattern A*) were found in 27 patients. In 9 of them the normal reactions were found in one examination only, while the second examination yielded an abnormal response. There remain, therefore, 18 patients in whom the reactions were normal on each examination. But even among those only in 10 cases the results of the two examinations were quite identical, while in the rest the second response, though showing the same general pattern, differed slightly from the first. Of the 54 reaction patterns observed in those 27 patients and falling within normal limits, 6 were on the low side and were classed as A(B), 4, labelled as A(Cl), showed a slight tendency to directional preponderance to the left, and 1, labelled A(Cr), to the right.

Pattern B was found in 6 cases. In 5 the response was greatly diminished on each examination; in 1 no trace of nystagmus could be found. In 3 more cases a subnormal response was found on one examination only, while the response on second examination was of a different character. In 4 of the cases with the diminished response an additional test with gross stimulation (water of 20° C. applied for 1 min.) was carried out. The responses were diminished, like those following mild stimulation. In the case which showed no trace of reaction on mild stimulation complete " anystagmus " (Pekelsky) was found on strong stimulation as well. In one case which on mild stimulation showed a distinctly diminished response the reaction to strong stimulation was within normal limits.

Pattern C was found in 10 cases on each examination. In 8 of those the direction of the preponderance was consistently to the left, in 1 case to the right, and in 1 it was to the left on the first and to the right on the second examination. In 2 of the cases the prevalence of the hot reactions over the cold formed an additional feature within the limits of that pattern. In 8 further cases directional preponderance was found on one examination only. In 7 of them it was a left preponderance. It is noteworthy that in 7 of that latter group the response on the second examination was normal, but in 2 of those 7 cases slight features of directional preponderance, though still in normal limits, were found.

Pattern D, similar to that found in cases of unilateral labyrinthine lesions, was observed in 3 cases. In none of them was there a history or any clinical sign or symptom of an ear affection. Slight features of that abnormality, though still within normal limits, were found in one case.

Pattern E (hot reactions exceeding cold reactions far beyond normal limits) was found in 4 cases. This feature, additional to a different type of abnormal response, was seen in 3 cases otherwise normal, in 1 case with diminished response, in 4 cases with directional preponderance.

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Special Features.

Exaggeration of all or some reactions beyond normal limits was found in 3 cases.

Deviation into the direction of the slow phase was observed in 10 cases. Only in 1 case did this phenomenon accompany all reactions and was present on both examinations. In 4 cases it was present in only one of the four reactions; in 3 cases in two reactions, and in 1 case in three reactions. It was found in association with each type of abnormal response except B.

The quality of the nystagmus varied considerably within one set of reactions. In a number of cases the nystagmus was coarser in the hot than in the cold reactions. The coarser nystagmus tended to last longer. In a group of cases with directional preponderance the nystagmus with the longer duration was particularly coarse.

Inequality of the reaction patterns found on the two examinations was observed in 10 cases. In 3 of them slight features of the pattern found on second examination could be traced in the pattern observed on first examination. In 9 of the 10 cases in which the reaction patterns were different on the two examinations one of the patterns was of the normal type, in 8 one was of the C (directional preponderance) type, and of those 7 belonged to the group Cl and only 1 to Cr. Type B occurred only twice among the cases with change of response, while pattern E occurred four times. The patterns A and C, therefore, were the most changeable. In 8 further cases the general features observed on first examination remained the same on the second occasion, but there appeared, in addition, features of another pattern, though still within normal limits.

No consistent relationship between the clinical types of schizophrenic reaction or any psychomotor or psychopathological feature and the various abnormal patterns of caloric response observed could be established in this case-material. There is only one fact which deserves notice, though in view of the small number of cases examined no conclusions can be drawn from it. While reaction patterns A, C, D and E were found in old-standing as well as in recent cases, pattern B (subnormal response) was observed in our material only in cases with a duration from three years upwards. The schizophrenic symptoms in the 6 cases in which that pattern was observed had become obvious 3, 4, 6, 8, 12, and 15 years respectively prior to the vestibular examinations. The patient in whom no trace of nystagmus could be elicited had been ill for four years. On the other hand, in a number of cases who had been in hospital for many years the response was either normal, or belonged to one of the other reaction patterns not characterized by diminished response.

The findings in cases where the schizophrenic reaction could be regarded as still in progress and in those where the condition was stationary did not differ. It is perhaps noteworthy that among the old-standing advanced cases with comparatively well preserved personalities, normal responses were found slightly more frequently than among those in whom the disintegration of the personality was more severe; but even this finding was not consistent enough to permit of generalization. Nor could we find any consistent relationship between certain contents of thought or the " ego reference " (Angyal and Blackman, 1940) or other clinical features, such as catalepsy, impulsiveness, etc., and any of the reaction patterns. Changes in the clinical picture which occurred in some cases between the first and second vestibular test did not result in a change of the pattern of responses. However, it is noteworthy that in one case of recurrent catatonia the first test carried out during a period of remission yielded a normal pattern, while the second test carried out during a catatonic spell with catalepsy and mutism showed the pattern of directional preponderance.

Discussion.

Our investigations have demonstrated a variety of abnormal responses to caloric stimulation of the external (horizontal) semicircular canals of the labyrinths in almost half of an unselected material of schizophrenic patients. The abnormal reaction patterns, with one exception, were identical with patterns found in verified organic lesions. The bilateral reduction of responses (pattern B) was similar to that found in cases with bilateral labyrinthine lesions involving the external (horizontal) semicircular canals. Pattern D corresponded to that found in cases with unilateral labyrinthine lesions. Considering the difficulties of an exact otological examination in this case-material it cannot be entirely excluded that in the few

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cases with pattern D a slight unilateral lesion of the internal ear may have been present, though the ear examination had been negative. However, it is more likely that this abnormal pattern represented a unilateral reduction of reactivity due to the same causes which in the cases with pattern B acted bilaterally. Pattern C (directional preponderance) was identical with that found in cases with unilateral lesions of the temporal lobes. Pattern E (hot responses of both ears far in excess of the cold) is not identical with any of the abnormal patterns found in the examination of both ears in cases with labyrinthine and cerebral lesions, but the feature of the hot response markedly exceeding the cold has been observed as a transient anomaly of the responses of the unoperated ear following labyrinthectomy (Cawthorne, Fitzgerald and Hallpike, 1942).

The responses in a number of individual patients showed a variability unknown in normal subjects and in patients with verified organic lesions. Variability of vestibular responses to thermal stimulation in individual schizophrenics has been observed by Löwenbach (1936). Previously Claude, Bourguignon and Baruk (1932) had found that the chronaxie of the vestibular nerves showed abnormal variability in catatonics and hebephrenics, especially in cataleptic states. The lack of relationship between any of the abnormal patterns and duration or clinical features of the schizophrenic condition has been noted by Löwenbach (1936). The deviation into the direction of the slow phase of the nystagmus, observed by the same authors and found by us in a number of tests, deserves special attention. Such a deviation as a result of caloric stimulation is known to occur in states of unconsciousness and semi-consciousness due to depression of cortical activity. There was no disturbance of consciousness in any of our cases. Deviation into the direction of the slow phase can be regarded as due to the result of the elimination of the fast component of the nystagmus, which is generally assumed to be of cortical origin. Loss of the fast phase in conditions of unconsciousness is in keeping with that assumption. The relative prevalence of the slow phase in a number of cases, expressing itself by deviation, could be regarded as a hint that in schizophrenics cortical mechanisms are involved. A further remarkable feature was the absence in schizophrenics of subjective sensations of the type of nausea or vertigo, even after gross stimulation. One of us (Stengel, 1928) has made the same observation in patients with post-encephalitic Parkinsonism. This coincidence is noteworthy in view of the fact that there exist certain similarities between disordered motor functions in schizophrenics and post-encephalitic patients. It is also of interest that according to Sercl and Vinar (1937) and Angyal and Blackman (1940) the vestibular response to rotation was normal in schizophrenics, though the response to thermal stimulation was altered. The same discrepancy was observed by Stengel (1928) during the oculogyric crises in post-encephalitic Parkinsonism.

At the present stage of investigations no conclusions can be drawn from the findings summarized above. Too little is known yet about the influence of abnormal mental states on vestibular reactivity and vice versa. Schilder (1933) has discussed that problem, but clinical and experimental data are still very scanty. There is need for further and repeated examinations in individual schizophrenics as well as in cases with other mental conditions. In view of the variability of the responses in individual patients, it is not impossible that in those of our cases in which the reactions in two examinations were found to be normal repeated tests may have demonstrated abnormal features. At any rate, our findings, though preliminary and incomplete in many respects, have shown that the changes in vestibular reactivity in schizophrenics are much more complicated than would appear from the statements of those writers who regarded an absolute diminution or loss of vestibular reactivity as the characteristic disturbance in schizophrenics. Some of the reaction patterns observed in our cases could be interpreted as the expression of a *relative* hypo-reactivity of peripheral or central parts of the vestibular apparatus, but in some cases there was even an exaggerated response. It is true that many of the known features of abnormal schizophrenic reactivity to physical and chemical agents could be regarded as indicating a depression of the functional activities of the organism as a whole (Golla, 1933), which Angyal, Freeman and Hoskins (1941) interpreted as the expression of the withdrawal of the total personality from external stimuli. However, there are other observations which do not fit into this concept, such as paradoxical and exaggerated reactions. A general theory of schizophrenic reactivity has to take into consideration not only the " negative "

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but also the " positive " features of altered reactivity. The variability of the responses to caloric stimulation of the labyrinths recalls an observation made by Dynes and Tod (1940), who found a considerable variability of responses to adrenaline and doryl in schizophrenics. Those authors suggested that the adaptive mechanisms of the schizophrenic to preserve the " steady state " (Cannon, 1935) were defective under stress. Other authors have noted in schizophrenics the occurrence of certain abnormal reflexes, which otherwise have been observed in association with verified lesions of the central nervous system. Fleischhacker (1943) has reviewed that subject and reported on new observations. The inconsistency and variability of all those findings have hitherto defied satisfactory interpretation. They suggest that in schizophrenics certain changes of nervous functions take place on the physiological level. The definition of those changes in terms of physiology and pathology is still an unsolved problem. Possibly further studies on vestibular reactivity will contribute towards its solution.

Conclusions.

Investigations into the responses to caloric stimulation of the external canals of the labyrinths have been carried out in a case-material of 50 unselected schizophrenic patients. The technique devised by Fitzgerald and Hallpike (1942), which is capable of revealing and measuring small differences in the caloric responses of both ears, has been employed. A variety of grossly abnormal response patterns was observed in a considerable number of cases. The abnormal response patterns were identical with or showed features similar to those found in verified lesions of the layrinths or its central connections. Of the special features observed in a number of cases the most remarkable was a conjugate deviation of the eyes into the direction of the slow phase of the nystagmus, which either modified or replaced the physiological response. A very considerable individual variability of vestibular reactivity unknown in normal subjects has been observed. No consistent relationship between the clinical types of schizophrenic conditions or certain psychomotor or psychopathological features and the various abnormal patterns of caloric responses observed could be established in this case-material. No theoretical conclusions have been drawn from these findings, which are in need of further elaboration, but the possible significance of the observations reported has been discussed tentatively.

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ELECTRIC CONVULSION TREATMENT IN PATIENTS OVER 60.*

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IN view of the success of E.C.T. in depressive states of the middle-aged it seemed worth while to take the risk of extending its benefit to patients over 60, whose clinical picture often differs very little from that of the next younger age-group. Since January, 1941, when E.C.T. was first used in the Crichton Royal, an increasing number of such patients has been treated. It is proposed to give a short, retrospective survey of these cases in order to assess if the therapy has justified itself by its results, and to find out the dangers and the limits of its application. Among over 500 patients treated were 76 over 60, 62 females and 14 males, with the following age distribution:

60–64	38
65–69	24
70–74	12
75 and over	2

The preponderance of women was mainly due to casual factors, such as the greater boldness in using E.C.T. of some physicians; but it should be mentioned that manic-depressive psychoses and involutional melancholia are—according to Kraepelin—more frequent in the female sex, which also has a longer expectation of life.

It was not easy to form distinctive *diagnostic groups* of this material (Table I),

TABLE I.—*Diagnoses.*

	Treated.	Recovered and improved.
Melancholia	29	23
,, + senility	20	16
Schizophrenia and paraphrenia	13	12
Manic-depressive illness	8	7
Senile-arteriosclerotic dementia and confusion	6	3

mainly because of the admixture of organic symptoms in many cases otherwise exhibiting an affective picture. Those showing the typical symptoms of involutional melancholia were classified as melancholia even when the depressive symptoms had become rigid and stereotyped and their emotional expressions were restricted or flattened. The majority of melancholias had been ill for many years; 5 had been successfully treated with convulsions produced by drugs (cardiazol and triazol), and later responded equally well to E.C.T. The clinical condition of the 8 patients classified as manic-depressives because of earlier similar attacks did not differ from that of the melancholias except for 2 cases of recurrent mania. Their oncoming manic phases had repeatedly been cut short by a few convulsions. In 20 patients the depression appeared in a definite organic setting with signs of impairment, for instance, of retention, loss of memory, deterioration of judgment and of personal habits. In only 6 cases of senile-arteriosclerotic dementia with confusion were affective symptoms entirely absent. Finally a group of 13 schizo-

* A paper read at the Quarterly Meeting of the Royal Medico-Psychological Association in London on February 24, 1944.

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phrenics and paraphrenics was found among the treated cases over 60. They were restless and disturbing patients, either hospitalized for many years or late catatonics and paraphrenics whose psychosis had started more recently. Most patients of this group received " maintenance treatment."

The duration of illness or of hospitalization has not been tabulated because of the mixture in the material of patients hospitalized for years with recent cases admitted since the treatment was begun.

In selecting an elderly patient for treatment one would expect his general *physical condition* to be of primary importance. In our series it was reported as good in 25, fair in 21, frail in 10 and poor in 20 patients, a majority thus being in a satisfactory state of health when the treatment started. However, following up those described as frail or poor, one finds that after the course of convulsions many showed the marked improvement of complexion, weight and general physical health so well known after E.C.T. in younger patients. On the other hand, out of the 15 patients who did not benefit from the treatment, 9 were in poor health before. Blood pressure before treatment was only of relative value as a danger signal, and neither systolic and diastolic nor pulse pressure proved correlated with the results of the treatment. For instance, of 9 patients with a pulse pressure over 90 mm. Hg before treatment, 2 made a recovery, 5 showed transient or permanent improvement and 2 remained unchanged. Systolic pressure over 200 mm. Hg seems no absolute contra-indication to E.C.T. provided the function of heart and circulation proves satisfactory on clinical examination.

One has to rely on one's clinical judgment, but the risk of vascular accidents seems smaller than one would expect. Only one patient (B.P. 200/110 mm. Hg) died with signs of coronary thrombosis, which first appeared two days after convulsion treatment. In another case (B.P. 160/110 mm. Hg) treatment had to be given up because of a vascular collapse after the first convulsion ; this patient made a spontaneous recovery some time later.

The *number of convulsions* given to each patient was relatively small if the cases under " maintenance treatment " are excluded. The latter was used in 27 patients who needed repeated single convulsions or small series to maintain them at their best level. The intervals varied between one treatment weekly and series of three to six convulsions twice a year (Moore, *J. Ment. Sci.*, April, 1943). If timed properly and used with discretion, maintenance treatment proved as effective in the elderly as it is in younger patients ; some of the maintenance cases had as many as 40 convulsions without harm. In the other cases the number of convulsions was naturally kept as low as possible : 14 patients had 2 to 4, 22 patients had 5 to 7, 9 patients had 8 to 10, 4 patients had 11 to 13 convulsions. When six or more treatments were necessary they were often given with longer intervals, two or three at a time.

In the absence of an adequate control group, the *results* of this therapy can only be judged from general clinical experience. Although surprising spontaneous remissions sometimes occur in affective psychoses of high age, it is safe to consider the figures of Tables I and II as far better than chance results. One has only to

TABLE II.—*Results.*

Recovered . . .	13	Discharged . . .	21
Improved . . .	21	In hospital . . .	49
Transient improvement .	27	Dead	6
Unchanged . . .	15		

remember how resistive this type of case is to any other kind of treatment, and how difficult the task of nursing, to appreciate the value of even partial or temporary improvements.

The qualification " recovered " in Table II was used for full restitution only. " Improved " often means removal of the more disturbing symptoms, especially of depressive features and the accompanying agitation, while organic symptoms of senility remained. " Transient improvement " refers to maintenance cases. There were cases from all diagnostic groups among the " unchanged," the highest proportion being among the senile arteriosclerotic dementias. The table of results gives a more reliable picture than the classification according to disposal, because

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many patients had no home to which they could have been discharged. Of the six patients now dead the only one in which there was a possible connection with the treatment has already been mentioned. Two died of bronchopneumonia, one of an oesophageal stricture, one of apoplexy occurring weeks after her last treatment, and one committed suicide.

The frequency and kind of *complications* experienced in this series was only slightly different from those in younger material. One spinal compression fracture occurred at a time before the hyperextension position was generally used; also one dislocated shoulder and one sprained ankle. One patient had an unsuspected fragility of bones; the first convulsion caused a fracture of a transverse process of the lumbar spine and an avulsion of a fragment of one humerus. In 3 cases we saw prolonged post-epileptic confusion with excitement lasting a few days. Two patients complained of headache and sickness for some hours. On the other hand, there were no excessive disturbances of memory, and no focal symptoms pointing to cerebral haemorrhage following the convulsion. One, probably specific, complication was the difficulty to produce a convulsion with the average voltage and the average stimulation time. Much higher values than usual were needed in 13 cases, and on several occasions it was impossible to produce the fit with the maximum of time and voltage one could risk. Insulin, 10–15 units given 30 minutes before treatment, with the idea of producing alkalosis, was not always effective. Frontal hyperostosis (Morgagni's symptom) was suspected as a possible cause of this difficulty, but could not be confirmed by X-rays of the skull.

To sum up our experiences in 76 patients over 60, one can maintain that electrically induced convulsions can, without undue risk, be employed in the treatment of psychoses of the elderly. In cases of affective illness or psychoses with an affective blending, the results at least equal those in younger age-groups considering the much poorer outlook of these psychoses in higher age. In other psychoses it relieves misery and distress, and counteracts mental and physical deterioration.

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THE SYNDROME OF HYSTERO-ENCEPHALOPATHY IN MILITARY PSYCHIATRIC CASUALTIES.

By G. Tayleur Stockings, Capt. R.A.M.C.

1. Introductory.

In a previous communication* to this Journal, the author described the results of three years' experience of pharmaco-electrical shock-therapy in the schizophrenic and depressive psychoses, and presented clinical and experimental evidence for an organic basis of these conditions. It was shown, firstly, that there is convincing evidence for supposing that deranged oxygen-glucose metabolism of the cerebral neurones is the essential lesion; and, secondly, that all these conditions can be classified according to their response to shock-therapy into two groups—dysoxic encephalopathy, or cerebral dysoxia, in which oxygen-metabolism is principally at fault, and which responds to anoxic shock; and dysglycolytic encephalopathy, or cerebral dysglycia, in which glucose-metabolism is at fault, and which responds to hypoglycaemic shock. The former condition is synonymous with depressive states, and the latter with schizophrenic reaction-types in the orthodox terminology.

For the purpose of this article, therefore, the classification and terminology suggested above will be adhered to; thus, the term "metabolic encephalopathy" (or simply "encephalopathy") will be employed in place of "psychosis," and "dysoxic encephalopathy" or "dysoxia," and "dysglycolytic encephalopathy" or "dysglycia" in place of "depressive state" and "schizophrenia" respectively. Similarly, the adjective "encephalopathic" is employed instead of "psychotic," and "dysoxic" for "depressive" and "dysglycolytic" or "dysglycic" for "schizophrenic" in the same way.

2. Hystero-Encephalopathy; Definition.

Since the author's previous communication, further studies have brought to light a considerable group of cases met with in military practice, in which gross hysterical manifestations are found co-existing with metabolic encephalopathy, producing a distinctive and striking clinical picture and often a difficult problem in diagnosis. The term "hystero-encephalopathy" is proposed for these cases, and this article will be devoted to a description and discussion of the syndrome, with illustrative cases from the author's experience.

The clinical condition of a hysterical reaction superimposed on an organic disease is well known, and often provides some of the most difficult diagnostic and therapeutic problems. In the case of hystero-encephalopathy, moreover, the problem is not one of merely separating the psychogenic from the physical symptoms; it is the differentiation of two separate sets of psychiatric signs and symptoms, with no simple diagnostic tests to guide the physician, such as, for example, the plantar reflex in a case of suspected hysterical monoplegia.

The personality-type and clinical features of the condition will now be briefly described, with illustrative cases.

3. Occurrence and Symptomatology.

The author's cases occurred in male service personnel between the ages of 20 and 40 years. In a large proportion of the cases the breakdown had a fairly acute onset, during service abroad under conditions of battle or climatic stress. In rather more than half the cases there was an associated degree of constitutional psychopathic inferiority, in the form of mild degrees of mental defect, emotional inadequacy, or strongly hysterical personality trends.

In all the cases encountered, with two doubtful exceptions, the encephalopathic symptoms were of the dysoxic type—that is, having an affective colouring of depression, apprehension and emotional tension; none of the cases presented

* "Shock Therapy in Psychoses: A Possible Rational Basis and its Clinical Applications," *Journ. Ment. Sci.*, April, 1944, p. 550.

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dysglycolytic features, in the form of bizarre delusional and hallucinatory material, associated with affective shallowness, fatuous elation, and association-disorder of the classically schizophrenic type.

The most common hysterical manifestations found were in the sensory and affective spheres, but motor and amnesic types were also found. The encephalopathic features were of the type commonly included under the group of depressive and mixed depressive-schizophrenic states, viz., acute depressions, delusions of persecution and self-reproach, aural hallucinations of persecutory and accusatory type, confusional states, conduct-disorders and suicidal tendencies. Thus, for example, the author has seen cases of catatonic stupor associated with hysterical blindness; hysterical paraplegia with depression and auditory hallucinosis; hysterical deafness with depression and delusional trends; massive amnesic states with alternating delusions of sin and self-reproach, and hysterical pains and paraesthesias associated with delusions of persecution. The outstanding characteristic is that the hysterical exist alongside with the encephalopathic symptoms, but independently of them; thus, the patient has insight into his hysterical symptoms and does not refer them to outside agencies; whereas the encephalopathic symptoms are projected, and insight into them is defective or absent.

4. The Clinical Picture.

The patient, usually a man showing a mild degree of mental defect or emotional inadequacy, develops a breakdown of fairly acute onset following prolonged stress, usually under battle or overseas service conditions. The onset is usually with severe anxiety symptoms alone—depression, headache of hysterical type, increasing insomnia, irritability and loss of efficiency and concentration. Later, the grosser hysterical manifestations—tremors, fugues, amnesic states, " blackouts," blindness or motor paralysis—make their appearance. Still later the frankly encephalopathic symptoms appear, in the form of persecutory delusions, complex auditory hallucinations in a setting of clear consciousness, ideas of influence, delusions of reference and self-reproach, bizarre feelings and conduct-disorders. The affective reaction throughout is, as previously indicated, one of severe depression, tension and fear. Sometimes, however, the encephalopathic features appear at the start simultaneously with the hysterical reaction; more rarely they are preceded by the encephalopathic signs.

On examination the clinical signs found are most commonly those of an acute anxiety-state with gross hysterical features, and often completely mask the encephalopathic signs. The patient is usually tense, apprehensive, and very emotional; often a peculiar mask-like, staring expression resembling that of the Parkinsonian syndrome is present. Gross tremors of the hands and facial muscles are common, with a variety of hysterical tics, such as blowing, puffing, or sighing noises accompanying speech, which is itself often grossly disordered in the form of a severe stammer and dysarthria, which often renders it almost unintelligible.

Grosser motor signs—less often found—include monoplegias, paraplegias, and astasia-abasias of the classical type.

On the sensory side, the severer cases may present a typical hysterical anaesthesia, deafness or amaurosis. In milder cases, visceral paraesthesias, formication, gastric pains, and acute headache are common sensory symptoms.

Acute agitation, restlessness, insomnia, disorientation and memory-defects are often found, and in the severer cases profound confusion and massive amnesia may be present. The somatic signs of acute anxiety are the rule in the great majority of cases.

The subjective complaints are of the usual anxiety and hysterical type—headache, depression, unpleasant mental tension, various phobias, irritability, and hyperacusis; worrying and obsessive thoughts, insomnia, inability to concentrate, vague pains and paraesthesias of various kinds.

The encephalopathic signs may be completely obscured by the neurotic symptoms, and may only be elicited on careful questioning; more commonly they become evident only at a later stage, when the restlessness, insomnia and mental distress increase or fail to respond to rest and sedation; unmistakable ideas of reference, delusions of self-reproach and of impending death, impulsive outbursts and auditory hallucinations then make their appearance. With regard to the last-mentioned symptom, it is important to differentiate these from the hypnagogic hallucinations

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which are commonly encountered in purely hysterical and anxiety states, and are often mistaken on superficial examination for true encephalopathic hallucinations.

The encephalopathic symptoms are, as already indicated, of the type commonly found in an acute dysoxic reaction. Particularly characteristic are auditory hallucinations of persecutory type; delusions of bodily disease, especially venereal disease; ideas that the patient is about to be court-martialled or shot, has disgraced the army and his family; or that everyone says he is a traitor or a fifth-columnist. It will be seen that the delusional material is closely connected with the patient's service-environment or battle-experiences.

The physical findings, apart from the somatic anxiety-signs and, in more acute cases, general toxaemia, are consistently negative.

Illustrative Cases.

Case 1.—Dysoxia with motor hysteria. Private, aged 34. Acute breakdown under bombing while serving in Malta. Diagnosis on admission—schizophrenia. Described while in hospital overseas as dull, apathetic, slovenly and dirty in habits. On examination he was dull, vacant, retarded and negativistic, with mask-like expression, monotonous voice, apathetic and detached. He showed gross tremors and a hysterical palsy of the left arm, with trophic changes and flexion-contracture of the hand. Gross astasia-abasia, with hysterical spasm of the legs. Multiple hypochondriacal pains and gastralgias. Memory and orientation intact. Physical findings, negative except for indolent ulcers of legs. A childish, feeble-minded individual of degenerate facial appearance.

The encephalopathic features responded well to anoxic shock, but the hysterical palsies persisted, although improved; he was finally transferred to an E.M.S. hospital for further psycho-therapeutic treatment.

Case 2.—A gunner, aged 21. History very incomplete. Onset under battle-stress in Middle East, apparently as typical acute katatonic encephalopathy. On admission, mute, stuporose, grimacing and hallucinated. The striking feature was generalized choreic movements, similar to those of Huntington's chorea, with hypotonia and classical "choreic hands," and quite unlike true katatonic mannerisms or hysterical tics. Physical findings, serology and C.S.F. negative.

Choreic movements improved spontaneously, and encephalopathic signs cleared up rapidly on E.C.T. Recovery, with complete amnesia for period of breakdown, and fair insight. Mild degree of feeble-mindedness. No history of previous rheumatic fever elicited.

Case 3.—A private, aged 23. Home-service only. Referred for acute depression, delusions of V.D., bowel-dysfunction, and impulsive suicidal attempt. On examination acutely depressed, agitated, with ideas of reference, guilt and self-reproach, and impending death. Gross hysterical tremors, severe dysarthria, and sucking movements of the mouth. Physical findings negative. A childish, very suggestible man with a gross degree of mental defect and obvious facial stigmata. Encephalopathic signs responded rapidly to E.C.T., and hysterical features also cleared up, except for residual emotional instability. Discharged as unfit for further service—recovered.

Diagnosis: Dysoxia with motor hysteria.

Case 4.—Private, aged 25. Breakdown while serving in Middle East; onset as acute depressive state, with ideas of guilt and self-reproach. Treated in overseas base-hospital with E.C.T., with temporary improvement. Poor record at school. On admission, simple and childish in manner. Fatuous smile; gross hysterical tics—tremor and jerking movements of head, dysarthria, and tremors of facial muscles. He showed marked somatic anxiety-signs (tachycardia and hyperidrosis). No encephalopathic signs evident on first examination. Physical signs negative except for severe acne facialis. Later he developed definite dysoxic signs—viz., acute agitated depression, with delusions of guilt and unworthiness, alternating with fatuous smiling, mannerisms, and emotional incongruity. He was treated by E.C.T., with good response, and eventually discharged the service, recovered.

Diagnosis: Dysoxia with motor hysteria.

Case 5.—Dysoxia with amnesic hysteria. R.A.F. corporal, aged 31. Admitted with history of having been found wandering in a state of acute amnesic fugue. Relatives stated that he had been very depressed, ill in appearance, and peculiar in behaviour for several weeks. Wife stated he had been always very uncertain in temper, and difficult to get on with.

On admission patient was correctly oriented, and remote memory was not grossly affected, but a definitely circumscribed massive recent amnesia was present. His facial expression was mask-like, and his manner childish and fatuously euphoric, with garrulous and inconsequent train of speech and complete lack of insight. Tremors and a moderate dysarthria were present, and the whole picture strongly suggestive of an organic encephalopathy. C.N.S., C.S.F., and blood Kahn tests, however, were all negative. Within a few days of admission, dysoxic signs in the form of acute agitated depression with delusions of self-reproach and unworthiness and phases of confusion appeared. These symptoms responded well to E.C.T., but the childish manner, emotional lability and lack of insight persisted. Patient discharged finally to care of his relatives, much improved.

Case 6.—Dysoxia with motor and amnesic features; mental deterioration. Private, regular, 9 years' service. Admitted with history of acute depressive breakdown shortly after disem-

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barkation from service in India. Professional boxer, with history of multiple concussions at various periods. Mental selection grading previously noted as S.G. 4. On examination depressed, agitated and tremulous; mask-like, tremulous facies of Parkinson-like appearance, constant blowing and puffing noises during speech, childish and facile manner and acute anxiety-signs. Memory and orientation grossly defective. Physical findings, blood Kahn and C.S.F. all negative. Within a few days of admission he became acutely confused, toxic, restless and maniacal, with delusions of self-reproach and unworthiness. He received E.C.T. with temporary improvement, but never complete remission, and was finally discharged to the care of his relatives, improved. On discharge was childish and facile, with persistent hysterical symptoms, but free of dysoxic signs. Subsequent to discharge he had an acute dysoxic relapse, requiring admission to a civilian mental hospital. This case was the only one which showed a poor response to E.C.T., and eventual mental deterioration.

Case 7.—Dysoxia with mixed motor and amnesic hysterical features. Gunner, aged 30. "Backward" from early age, with long-standing history of hysterical tendencies in civilian life. History of concussion five years previously. Admitted with history of recent onset of acutely depressed, agitated state. On admission, acutely depressed, tense, agitated, and tearful. Mildly disoriented, with defective memory for recent events: all usual severe anxiety-symptoms present, with a very marked dysarthria, rendering speech completely unintelligible at times; a very pronounced degree of histrionic exaggeration of symptoms was apparent. Physical findings negative. Dysoxic signs appeared in a few days in form of persecutory delusions and aural hallucinosis. Good response to E.C.T., with abolition of dysoxic features, but hysterical signs in the form of stammer and emotional instability persisted in mild form up to time of discharge. He was a simple and childish high-grade mental defective, and was discharged as unfit for further service.

Case 8.—Dysoxia with sensory hysteria. R.A.S.C. driver, aged 35. Invalided from Italy with history of acute depressive breakdown, with delusions of self-reproach and aural hallucinations. On admission dysoxic features were well marked; he was dull, confused, perplexed in manner, and alternately vacant and retarded, and fatuous and smiling foolishly. Auditory hallucinosis and delusions that everyone thought he was Hitler, and that he was about to be put to death as a criminal.

Mask-like facies, lingual tremors, tingling and numbness of the legs, and cutaneous anaesthesia of the arms and hands of hysterical type. Anxiety-signs marked—agitated, tremulous, and at times acutely apprehensive. Physical and C.S.F. findings all negative. A definite degree of dullness and backwardness was evident.

Encephalopathic symptoms cleared up well following E.C.T., but the hysterical anaesthesia and emotional instability persisted, and he was finally transferred to a neurological unit for further investigation and psychotherapy. The negative physical findings were subsequently confirmed.

Case 9.—Dysglycia with sensory hysteria. Private, aged 22. Acute onset as depressive reaction while serving in Italy. History very scanty. Previous acute depressed illness at 17 years, with, apparently, an acute amnesic episode. On admission, depressed, tense, restless, agitated; principal symptoms were headache, vivid and disagreeable mental imagery, obsessive-compulsive ideas, hypnagogic hallucinations, generalized pains and paraesthesias of hysterical type, fears of impending death, and suicidal impulses. Anxiety signs pronounced; insight and judgment good. At no time were any true hallucinations or delusions of encephalopathic type demonstrable. Physical findings negative. No improvement with continuous veronal narcosis; slight improvement only on E.C.T. Subsequently treated with insulin; prompt response and eventual recovery.

In spite of the absence of definite encephalopathic signs, this case would appear, in view of the poor response to E.C.T. and the favourable outcome with insulin, to be one of the rare combination of dysglycia with a hysterical reaction.

Case 10.—Dysglycia with sensory hysteria. Airman, aged 40. Chronic history of many years' backache without organic signs; repeatedly investigated in medical and surgical units with consistently negative findings; worrying and depression; history of considerable domestic stress, and poor adjustment to service life. Admitted with history of recent development of persecutory delusions. On admission, a pale, worried-looking man, anxious and very hypochondriacal, with complaint of persistent backache and a variety of generalized aches and pains. No evidence of encephalopathic features on first interview. Physical findings negative, except for slight bilateral Dupuytren's contracture of the hands. Within a week of admission became restless and sleepless, with delusions of persecution and nocturnal interference by means of poison gas and food-drugging, auditory hallucinations, and ideas of reference. E.C.T. given with little improvement; subsequently changed over to insulin, with good response. Dysglycolytic symptoms cleared up, with partial insight; hysterical pains entirely unaffected, and were still present on discharge.

Case 11.—Dysoxia with hysteria of mixed type. R.A.S.C. driver, aged 33. One previous breakdown in civil life, apparently of acute dysoxic type. Admitted following development of acute depressive-confusional state while at a convalescent depot, where he had been transferred after a meniscectomy for ruptured cartilage. On examination, exhibited a mixture of dysoxic and hysterical features; was agitated, disoriented, restless, sleepless, and disconnected in stream of talk, and complained of headache, depression, worrying and feelings of being "mixed up in his head." Dysoxic signs were evident from the start—ideas of reference, thought-reading,

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influence; feelings of guilt and self-reproach, but no hallucinations. Emotional reaction bizarre, with alternating agitation and weeping, and fatuous smiling and laughter. Physical findings negative, apart from the operation-scar on his leg. Treated by E.C.T. with good response and resolution of dysoxic symptoms, but anxiety-symptoms persisted in mild form. A simple, facile and childish individual, with a mild degree of mental defect.

Case 12.—Dysoxia with hysterical hyperpnoea. A simple and childish high-grade defective, aged 37, invalided from Italy with an acute dysoxic breakdown. Most striking features were episodes of acute paroxysmal hysterical hyperpnœa with dramatic posturing, weeping, and thrashing of the limbs (i.e., typical *grande-hystérie*), with periods of acute hallucinosis of persecutory type, ideas of reference, guilt and self-reproach, and delusions of interference. He responded well at first to E.C.T., only to relapse repeatedly as soon as this was discontinued. He was finally tried on insulin, with a moderately good remission, but at the time of writing remains childish and simple in manner, with poor insight. Patient is still in hospital under observation. Physical findings and C.S.F. negative. In view of the prompt although transient response to E.C.T. and much less marked improvement on insulin, this case must be considered to belong to the dysoxic group of encephalopathies.

Case 13.—Dysoxia with hysterical fits and psychopathy. Private, aged 24. Always dull and backward. Poor social and work-record. One Borstal sentence for larceny. Previously transferred to Pioneer Corps on account of mental instability. History of typical hysterical fits, delinquency, and slovenly habits. On admission was dull, mildly retarded and disoriented, with defective memory, vacant expression, and mood of depression. Physical findings negative. No evidence from clinical findings or history to suggest an epileptic basis. Although no fits were witnessed while under observation, the history clearly indicated these to have been of hysterical type associated with fugues.

No evidence of delusions or hallucinosis. Depression failed to respond to benzedrine sulphate orally, but cleared up rapidly on E.C.T. Patient was discharged much improved.

Case 14.—Sapper, R.E., aged 40. Referred for recent acute depressed state, with aural hallucinations, suicidal impulses, and ideas of reference. Long history of nervousness, worrying and inadequacy in civil life; two previous major breakdowns of depressive type. Generally poor adaptation to army life. On examination, presented symptoms and signs of acute anxiety-hysteria; tension, gross generalized tremors, acute headache, hyperidrosis and tachycardia. Depressed and acutely miserable, with melancholic facies and attitude; memory and orientation fair. Later he admitted nocturnal aural hallucinations of his brother's voice—these were of true dysoxic type. Physical findings negative. Response to E.C.T. prompt, with abolition of hallucinations and acute depressive features, but emotional instability and anxiety-symptoms persist in mild form at time of writing. A simple and childish individual, of low intelligence and constitutionally inadequate personality.

Diagnosis: Dysoxia with hysteria of sensori-motor type.

Differential Diagnosis and Discussion.

Organic brain-disease can be readily distinguished by serological tests, examination of the retinal vessels, and if necessary, by radiological examination of the skull, with or without encephalography.

The conditions with which the hystero-encephalopathic syndrome may be most readily confused are epileptic states, acute neurotic depressions, pure endogenous depressions, and hysterical psychopathic states.

Epileptic equivalents of the psychical type, with confusional episodes, hallucinosis, depressive manifestations, and apparently "hysterical" features, may be a source of difficulty, especially where convulsive or minor epileptic phenomena are absent. In these cases the electro-encephalogram is of the greatest value; a negative EEG with a doubtful or negative history of fits may be taken as conclusive evidence against this condition.

Acute neurotic and psychopathic depressive states often bear a strong superficial resemblance to hystero-encephalopathy, especially when there is a marked degree of dysphoria, confusional features, and conduct disorder. The important fact to be borne in mind is that true encephalopathic delusions and hallucinations are not found in these conditions; their presence is the *sine qua non* for the diagnosis of hystero-encephalopathy, and from them must be carefully distinguished the obsessional thoughts of injustice and resentment, and the hypnagogic hallucinations and nightmares found in the psychopathic and neurotic depressive states. Finally, the latter conditions always show a much poorer response to anoxic shock therapy than the true hystero-encephalopathies.

The diagnostic criteria of the hystero-encephalopathic syndrome may be therefore briefly summarized as follows:

(1) The presence of co-existing hysterical and encephalopathic symptoms in the same individual.

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(2) The two sets of symptoms are independent and not interconnected; in other words the hysterical symptoms are not woven into the delusions, or ascribed by the patient to outside agency, as are the encephalopathic symptoms.

(3) Insight into the hysterical symptoms is present, but is absent or defective as regards the encephalopathic symptoms.

(4) The effect of anoxic shock-therapy is characteristic; the encephalopathic features are favourably influenced, but the hysterical symptoms are little affected.

(5) Negative physical findings.

Course and Prognosis.

The prognosis as regards the encephalopathic part of the syndrome is, as already indicated, generally favourable. In only one of the author's series of cases (Case 6) was the end-result mental deterioration, necessitating certification to a civil mental hospital. The hysterical features are, as has been pointed out, much more obstinate; these, however, usually tend to clear up spontaneously in course of time, although often persisting in mild form long after the grosser manifestations have resolved. Their final disappearance is usually markedly hastened by the prospect of release from the service and return to the patient's home surroundings. Usually the patient on discharge has mild anxiety or hysterical residua, with little or no serious disability.

The prognosis may, generally speaking, be assumed to be the same as for an uncomplicated dysoxia or hysterical reaction. The presence of the hysterical reaction does not appear to affect adversely the course and prognosis of the encephalopathy, and vice versa; and the presence of mental defect or constitutional psychopathic inferiority does not appear to have an unfavourable effect on the prognosis of either set of symptoms.

In the one case in the author's series which showed subsequent mental deterioration there was an undoubted element of organic cerebral damage, due to repeated cerebral trauma.

Treatment.

Treatment of the condition resolves itself into the treatment of the encephalopathy, which is by far the most important, and that of the hysterical features.

As already indicated, the encephalopathy, being most commonly of the dysoxic group, responds well to anoxic shock, which is administered in the usual manner; generally, the number of applications required to effect remission is 7 to 10, the frequency of administration being thrice weekly. The hysterical symptoms, as stated, are much more resistant to shock-therapy, but usually tend to clear up gradually without special treatment; for persisting hysterical residua, simple psychotherapy is combined with bromide medication for cases with persistent raised nervous tension and excitability, or small doses of benzedrine sulphate for those in which mild depression and asthenia are the principal symptoms.

The most important point to bear in mind is that when once the dysoxic symptoms have cleared up, and the residua are purely hysterical, it is useless to persist with anoxic shock, which may indeed be actually harmful at this stage, on account of the fear and apprehension which it induces in many cases.

The author has found that it is rarely necessary to resort to hypoglycaemic shock therapy for these cases. Of the series of cases described, only two (Cases 9 and 10) failed to respond to anoxic shock, finally necessitating insulin therapy, to which both made a favourable response.

Summary.

(1) The syndrome of hystero-encephalopathy as found in military psychiatric casualties is clinically defined and described.

(2) Its close association with mental defect and exposure to severe stress is emphasized.

(3) Fourteen typical cases, twelve dysoxic and two dysglycic, are described.

(4) The favourable response to anoxic shock therapy is indicated.

(5) The comparative rarity of dysglycia in combination with hysterical symptoms is emphasized.

(6) The comparative ineffectiveness of shock therapy for the symptomatic treatment of neurotic symptoms is confirmed.

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SCHIZOPHRENIA IN MILITARY PSYCHIATRIC PRACTICE.

By G. Tayleur Stockings, Capt. R.A.M.C.

[Received June 25, 1944.]

The object of this paper is to present a brief review of nearly five years' experience of the schizophrenic group of psychoses as found in military practice, with particular reference to its treatment, and to important new facts which have recently come to light regarding the relative values of the convulsive and insulin therapies.

Forms Commonly Encountered.

Schizophrenia in its various forms is by far the commonest psychotic condition encountered in the Army to-day. The reason for this is that the age-group of men encountered is 20–35 years, at which period of life the disease is commonest. The form of the disease does not differ from that found in civil practice, except that it is much more frequently detected in its early stages, since conduct changes which would probably go unrecognized in civil life, when they occur in a soldier are quickly detected by his officers or N.C.O.'s, and the man referred for treatment.

The most common early symptoms for which a man is referred are conduct-changes, peculiar behaviour observed by his N.C.O.'s or comrades, disciplinary offences—*e.g.*, going absent without leave, or impulsive or aggressive behaviour, failure to respond to training, or the sudden onset of acute confusional symptoms. Thus, the gradual onset of apathy, loss of interest and slovenly habits in a man who has previously been a keen and efficient soldier is often pathognomonic of the condition. It is exceptional for the man to report sick of his own accord, and he is usually referred by the officer or N.C.O. in charge of his military unit.

Acute confusion of sudden onset is one of the commonest early symptoms, in contrast to what is commonly stated in most text-books—viz., that the phenomena of schizophrenia occur most commonly in a setting of clear consciousness.

The commonest types found are the hebephrenic, with bizarre delusions and hallucinations and disorder of thought, and the depressed type, with mental confusion and hallucinosis; paranoid types and schizophrenia simplex are less common. Katatonic excitements and stupors are also commonly found.

Differential Diagnosis.

The differential diagnosis is often difficult, especially where the onset has been insidious with slight symptoms.

In the acute confusional form, the principal diagnosis is from the acute hysterical states. The presence of severe headache, absence of bizarre hallucinations, mannerisms, incontinence and degraded habits in hysterical confusional states are the most reliable diagnostic signs. The response to narco-analysis is also a reliable test.

Psychopathic personalities with acute excitement and conduct-disorder often cause difficulty; here the past history and the absence of true hallucinations and delusions should help the diagnosis.

Epileptic hallucinatory-confusional states are occasionally a source of difficulty; the history of fits and the electro-encephalogram—the latter particularly—have been found to be the most reliable guide.

Mental defect with mild hysterical or depressive features is often difficult to distinguish from the simple form of schizophrenia, particularly as the two conditions often coexist; a period of close observation for the appearance of definite psychotic symptoms is often necessary in these cases.

Acute depressive psychoses of the manic-depressive type are sometimes a source of difficulty, since a simple or hebephrenic schizophrenia in the early stages often exhibits symptoms identical with those of an acute psychotic depression. The poor

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response to electro-convulsive therapy, however, and the gradual replacement of depression and anxiety by dullness, apathy and profound mental confusion, soon indicate the schizophrenic nature of the condition. In general, manic-depressive insanity is an uncommon condition in military psychiatry on account of the age-groups dealt with, and acute psychotic depressions nearly always turn out to be a manifestation of schizophrenia.

An important condition which sometimes simulates the psychosis closely is a species of acute obsessional state with mixed anxiety features, which appears to be peculiar to soldiers, and is best described by the name of " justice neurosis." These cases are usually admitted to hospital with a diagnosis of " paranoid schizophrenia"; the patient is usually tense, anxious and agitated ; he complains of unfair treatment by N.C.O.'s and officers, victimization, " not having had a square deal," bullying and being " picked on " by other men. The condition usually settles down quickly without special treatment, and true psychotic delusions and hallucinations are absent, the man's grievances always having a real basis of fact.

The last condition which may lead to difficulties is malingering. In my experience, pure malingering is very rare, contrary to what might be expected. There is almost always a strong element of psychopathic personality or feeblemindedness associated with this condition, and the diagnosis can be usually confirmed by a few days' skilled observation.

Considerations in Treatment.

We now come to the practical applications of shock-therapy in military practice. The outstanding fact which has been observed in a series of over 300 cases so treated, is that schizophrenic cases can be differentiated for practical purposes into two distinct groups—one which responds to anoxic shock, but not to insulin, and one which responds to insulin, but not to anoxic shock-therapy ; these groups can be distinguished clinically by certain distinctive symptoms.

The first group, which will be referred to as the dysoxic type, is distinguished by depression of mood, slowing of cerebration, apathy, and general underactivity ; it includes psychotic depressions, paranoid schizophrenics with a depressive setting, katatonic stupors, simple schizophrenia, and some types of alcoholic hallucinosis without dementia. Anoxic shock appears to have a specific stimulating effect on these cases.

The second group, which will be referred to as the dysglycolytic type, is distinguished by the opposite symptoms of overactivity, elation, motor excitement, and rich variety of bizarre delusions and hallucinations. It comprises the acute manias, hebephrenic and katatonic excitement and paraphrenias. Insulin appears to have a specific tranquillizing effect in these cases, and directly influences the underlying thought-disorder, which does not appear to be affected by anoxic shock-therapy.

My technique in treatment does not differ in essentials from that laid down in standard works on the subject, except as regards the frequency of application in anoxic shock-therapy. It has been found that in very acute dysoxic cases—e.g. acute katatonic stupors—it is quite useless to give shock-therapy two to three times weekly ; application once daily for the first five shocks is found to be the optimum frequency, followed by application on alternate days, until a remission has been produced. In milder cases, shock-therapy on alternate days is usually sufficient. Remission is usually obtained after 7–10 shocks, and it is exceptional for more than 10 applications to be required. The course of treatment is spread over a period of approximately three weeks.

In dysglycolytic cases it is usually found that a course of 20 comas is sufficient to produce a remission. The technique used is similar to that laid down in standard works, except that the intravenous method of termination is used in all cases, followed by a high carbohydrate meal immediately on waking ; it has been found that with this method the oral glucose feed can be safely dispensed with—an important consideration in wartime where stocks of glucose are strictly rationed. The course of treatment lasts approximately six weeks.

Results Obtained.

It has been found that of all cases treated, complete remission may be expected in 70 per cent., improvement in 15 per cent., and failure in 15 per cent. The average stay in hospital is 8–10 weeks.

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Prognosis.

As regards prognosis, it has been found that, generally speaking, the acute katatonic stupors with marked ideas of guilt and mental confusion have the worst prognosis, especially if occurring under the age of 20 years. They do not respond at all to insulin, and are much more resistant to shock than the other dysoxic types. It has been observed that cardiazol combined with electro-shock produces a much more marked beneficial effect in this type than does electro-therapy alone.

Typical hebephrenic and delusional schizophrenias have been found on the whole to respond very well to insulin.

Of other factors influencing the course of the disease, it has been found that a bad prognosis is not necessarily always associated with the following: a bad family history, bad prepsychotic personality, co-existing mental defect, and disorder of conceptual thinking of the hebephrenic type. A good prognosis is not necessarily associated with acute onset of the psychosis, adequate precipitating factors, good previous personality record and sound family history.

After-Treatment.

It is the general rule in the services that all patients who have had a definite psychotic breakdown, whether fully recovered or not, are invalided out of the service as permanently unfit at the termination of their treatment. Removal from the stresses and unusual situations of army life has been in the great majority of cases found to be the only effective safeguard against relapse.

The only exceptions made are in the case of men with good prepsychotic personality records, and whose breakdown has occurred under exceptional stress. In these cases, downgrading to home service category and return to duty after an adequate period of sick-leave is considered.

In the vast majority of military psychotics, who have made a full recovery, it is found that residual mild anxiety-signs with lowered morale, lack of confidence, and dread of return to duty remain; these symptoms are simply the natural after-effects of a terrible and shattering experience, and not due to any specific post-psychotic deterioration. They invariably clear up after return to civilian life.

In conclusion, emphasis should be laid on the great importance of early diagnosis and early and energetic treatment in the schizophrenic psychoses. If these desiderata can be fulfilled, and the differentiation of the dysoxic and dysglycolytic types and their appropriate treatments be clearly recognized, there is no reason why that pathetic figure, the chronic schizophrenic dement, should not soon become a pathological rarity in psychiatric hospitals.

Summary.

(1) The common clinical manifestations of schizophrenic psychosis as found in military psychiatry, and its differential diagnosis, are described.

(2) The clinical and prognostic characteristics of the two main types, dysoxic and dysglycolytic, are differentiated and described.

(3) The favourable prognosis in the majority of the cases is indicated.

(4) The importance of early and energetic therapy is emphasized.

My acknowledgments are due to Lieut.-Colonel R. W. Armstong for permission to use the case material described in the compilation of this article.

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DELINQUENT DEFECTIVES.

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[Received November 9, 1944.]

THE growing incidence of juvenile delinquency during the past years has become a serious concern of the general public and the authorities. Following the lead taken by the Home Office, a number of local authorities, child guidance clinics and welfare agencies have instituted inquiries into the causes and conditioning factors of juvenile crime from the social, economic and medico-psychological points of view. The institutions for the mentally defective have been faced with the same problem through the increasing number of cases referred by the juvenile courts, and Dr. D. Turner, in his Annual Report on the Royal Eastern Counties Institution, Colchester, for the year 1943, called attention to the difficulties of their management within an institution of the usual type. The question calls urgently for a settled policy regarding their disposal and treatment, and it goes without saying that this can only be attained on the ground of a better insight into the psychology of the delinquent defective.

I made a tentative approach to this problem as it confronts us at the R.W.C.I. by a survey of 210 male patients, delinquents and non-delinquents, with special reference to the relation of the existing mental defect to their delinquent behaviour. The group reviewed comprises all ages from 16 to 54, but the majority of patients —four-fifths of them—are of adolescent age. With few exceptions they were admitted to the institution at school age, and the criminal records of most of the offenders among them date back to the pre-war period. They are not, therefore, in any way representative of the present increase of juvenile delinquency. They live in three separate villas at our Langdon Extension, and are engaged in agricultural and garden work, in various industrial occupations and domestic duties. Seventy are on daily outside employment with local gardeners and farmers. In view of the limited objective of the present survey, little can be said regarding their social and economic background, their home conditions, etc. Be it sufficient to remark that the case-records of both the delinquent and the non-delinquent group tell the same story of economic distress, broken homes, illegitimacy, etc., such as are mentioned as the principal conditioning factors of delinquency in the general population.

Their mentality ranges from the low-grade feebleminded to the highest grades, with a few imbeciles and high-grade border-line defectives at both ends of the scale. The group does not comprise idiots or epileptics. Licensed patients are likewise excluded. The top column in Table I gives the mental ratio of the patients reviewed on the Terman-Merrill scale (1937). In some older patients the I.Q. was assessed by the Binet-Simon scale. The second column gives the number of patients in each group, the third shows the aggregate figure of delinquency on the respective levels, whilst the last column indicates the corresponding percentage figures. Here I may remark that the term delinquency is used to indicate patients who have been convicted of a punishable offence by a judicial authority, or in whom the charge was dismissed owing to their mental defect. The offences comprise petty pilfering, larceny, damage to property, violence against persons, sexual misdemeanours, etc., single or recurrent. The aggregate figure of delinquency indicates the incidence of offences, whatever their nature, in the subgroups reviewed. Recurrent delinquency indicates recurrent offences, whatever their nature, in the same patient.

* Based on a paper read to the Conference of Officers of the Five English Voluntary Institutions at Birmingham, October 5, 1944.

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TABLE I.—*Grand Total of Patients Reviewed. The Table shows an Increase in the Aggregate Figures of Delinquency with the Rise of the I.Q.*

I.Q.	30–40.	40–50.	50–60.	60–70.	70–80.	80–90.	Total.
Number of patients . .	14	56	76	34	20	10	210
Delinquents	0	21	39	18	16	9	103
Delinquent per cent. . .	0	37	51	53	80	90	49

The first fact that emerges from this table is the striking increase of delinquency as we proceed from the lower end to the upper end of the scale. It is zero up to an I.Q. of 40, that is in the group of 14 imbeciles and low-grade feebleminded, whereas 9 out of 10 cases with an I.Q. of 80 to 90, or above, show a history of recurrent offences. However, it goes without saying that conclusions which might be drawn from this state of affairs are subject to a number of qualifications. Quite apart from the exclusion of idiots, epileptics, or licensed patients, our group cannot be regarded as an unselected sample of the general M.D. population. Like the majority of hospital patients, our inmates are largely derived from a special social class. Further, owing to the geographical position of the Royal Western Counties Institution, they are mostly recruited from agricultural areas. This may or may not appreciably affect our figures;, but there is another important factor which obviously has a pronounced influence upon the gross increase of delinquency among patients of the higher grades which is suggested by our table. Mental defectives above an I.Q. of 70 are rarely admitted to an institution unless there is another compelling reason for doing so. In most cases this " other " reason is nothing else than their delinquent behaviour. The proportion of delinquents to non-delinquents with an I.Q. round about 70 in the general population cannot be assessed, but the fact is that unless a person of this mental grade gets into conflict with the law, he is unlikely to be included in a statistical survey like the present. From this follows that the figures appearing on the upper end of our scale are " biased " to a considerable degree, and that only the four sub-groups with an I.Q. below 70 can be regarded as a representative sample of the M.D. population of the country (Table II).

Accordingly, in Table III Fisher's χ^2 test of significance is being applied to this

TABLE II.—*This Table Shows the Incidence of Delinquency in the Group after Exclusion of the Highest Grades (I.Q. 70–90).*

I.Q.	30–40.	40–50.	50–60.	60–70.	Total.
Number of patients . . .	14	56	76	34	180
Delinquents	0	21	39	18	78
Delinquent per cent. . . .	0	37·5	51·3	53	43·3

TABLE III.—*Fisher's χ^2 Test of Significance Applied to Figures shown in Table II. The Result Suggests a Degree of Association between I.Q. and Delinquency which is in Excess of the Conventional Level of Significance.*

I.Q.	30–40.	40–50.	50–60.	60–70.	Total.
Actual figures of delinquency .	0	21	39	18	78
Expected figures of delinquency .	6·06	24·26	32·9	14·73	78
Difference	−6·06	−3·26	+6·1	+3·27	0
Difference^2 ÷ expected number .	0·06	0·45	1·13	0·72	$\chi^2 = 8·36$

$$n = 3; \quad P = <0·05.$$

unselected sample only. It shows that, on the hypothesis of an average of 43·3 per cent. delinquency in this group, 6·06 delinquents should be expected in the lowest class, 24·26 and 32·9 in the two intermediary classes, and 15·73 in the group with an I.Q. of 60 to 70 per cent. However, the actual figures show a pronounced departure from uniformity amounting to from − 6·06, − 3·26, + 6·1 to + 3·27 respectively. This gives the value of 8·36 for χ^2, which corresponds with a probability of less than 0·05 that the association found between mental defect and delinquency be due to chance alone. In other words, the association suggested in Tables I and II can rightly be regarded as statistically significant.

Graphs 1 and 2 are based on the percentage figures of delinquency in the whole

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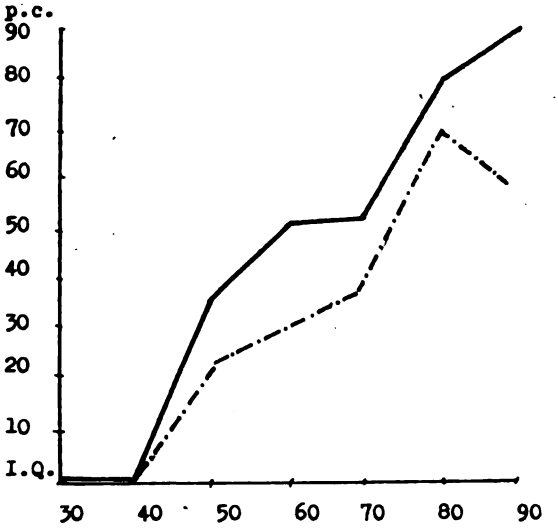
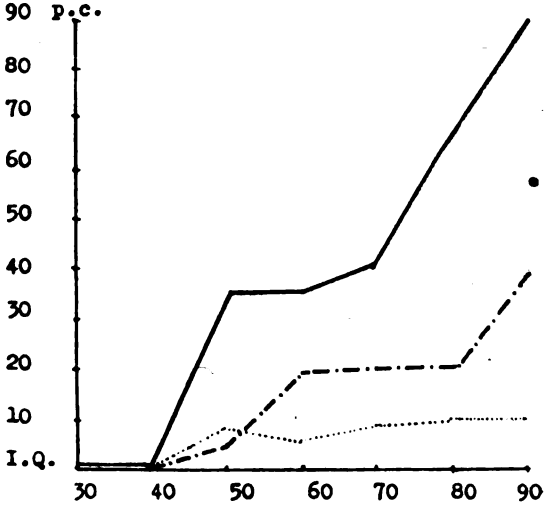


Aggregate figures of delinquency, single and recurrent.

Recurrent delinquency.

GRAPH 1.



Petty pilfering, larceny, etc.

Sexual misdemeanour.

Violence.

GRAPH 2.

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group including the highest grades. They illustrate roughly the same distribution but, for reasons indicated above, likewise tend to exaggerate the true incidence of delinquency above an I.Q. of 70. The analysis of the various classes of delinquency represented in the graph is subject to the same qualification. To this we must add the absence of epileptics and licensed patients from our group, and the tendency to defer licence in sexual offenders for a longer period than in more harmless offences as further selective factors.

What, then, do we learn from our survey? Is it permissible to regard the marked increase in the figures of delinquency with the rise of the intelligence quotient, observed in our group, as indicative of a causal relationship? There is nothing to justify such a contention. It will be noted that, for instance, only 53 per cent. of the patients with an intelligence quotient between 60 and 70 have a record of delinquency. This figure is certainly high enough, but it does not explain why the remaining 47 per cent. have no such record. This can only be due to causes which have so far remained outside our inquiry. Other investigators have in fact called attention to the importance of environmental conditions, social, economic and otherwise, in the causation of juvenile crime. However, I mentioned that a tentative survey of our material has been inconclusive in this respect. Poor parentage, slum conditions, etc., are equally common in the histories of normal delinquents and of mental defectives in general. On the other hand, we found that delinquency is nearly absent in the lowest group of defectives, whereas both environmental and hereditary conditions are known to be at least equally poor in low-grade defectives as in higher grades.

All this goes far to show that the accumulation of statistical data is unlikely to furnish deeper insight into the causes and conditioning factors which are operative in our delinquent group. It may be as well, therefore, to review the principal facts revealed in the light of their psychological appreciation. To begin with, we have to deal with a possible objection. It may be argued that speaking of delinquency in the legal sense in defectives of comparatively low mentality such as were included in our survey is hardly justifiable. They may exhibit a variety of behaviour difficulties such as faulty or destructive habits, uncontrolled motor reactions, etc., but it is a matter of convention that they are not held responsible for such acts. It may be claimed that it is no coincidence that mental defectives have from time immemorial been regarded as the "Holy Innocents," and measured by a different standard of social obligations and responsibilities. In these circumstances it may well be questioned whether it is reasonable to refer to their misdemeanours under the same heading as the behaviour difficulties on a higher level of the intelligence scale, and whether it was justified at all to include them in our material.

However, it is readily understood that from the medico-psychological point of view the discrimination between the two types of behaviour difficulties is purely arbitrary. Every experienced nurse will confirm that in certain essential points the behaviour of the low-grade defective—and of the infant, for that matter—is subject to the same psychological laws as the behaviour of a normal person. An imbecile may soil and wet himself for precisely the same reasons as a problem child of average intelligence would wet his bed. But while the latter is able to resort to alternative ways of asserting his personality against his social environment, the low-grade defective—like the infant—may have hardly more efficient means at his disposal than his inadequate sphincter control. The same is true for the defective of medium grade if only we make allowance for his comparatively greater freedom of action and self-expression. Putting it in terms of Adler's Individual Psychology, we should say that he has more adequate means of compensation for his feeling of inferiority and for his real shortcomings.

Anti-social behaviour in defectives above the imbecile grade can be interpreted in the same vein. A patient of this class need not confine himself to the symbolic act. He can derive both immediate benefit and a feeling of psychological gratification from a bun stolen from his neighbour's plate. Again, the feebleminded of highest grade can resort to yet more subtle means of self-assertion. In fact, he is more likely to seek to restore the balance of his self-respect than a patient of lower mentality who is less sorely aware of his limitations. He may try to sell the farm produce of his employer; he may forge a cheque; he may pose as a doctor or clergyman. But however hard he tries, he will rarely escape the feeling of inade-

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quacy that looms at the back of his mind. He will notice the successes of his fellows which were denied to him, and realize his inability to compete with them on equal terms; this is why he may seek to compete with them on unequal terms. He may be aware that he is incapable of flooring his opponent by a straight punch; this is why he may try to hit "below the belt." He may actually develop this kind of technique as his persistent *style of life*, and fall back on it whenever he is frustrated. He may then be described as an incorrigible recidivist or a "moral defective." But apart from the not too frequent cases of true psychopathy of organic origin, such as post-encephalitic conditions, and a few border-line schizophrenics, here, again, the fundamental similarity of the various patterns of anti-social behaviour becomes apparent. Both high grade and low grade defectives respond with the same uniformity of reactions when faced with difficulties. Their means of expression may differ according to their respective levels of intelligence and to their mental equipment in general, but the common denominator of their anti-social behaviour remains their protest against the exigencies of life in the community, or against what Freud called "civilization and its discontents."

If this interpretation is true, delinquency in the group reviewed here—and presumably in mentally defectives in general—is nothing else than the specific reaction of the patient to his shortcomings. It is largely due to his attempt to make up—by hook or by crook—for his deficiency. One type of patient may choose ways and means for this end that bring him into conflict with the law. He may resort to indecent exposure, to theft or violence. The other type may content himself with masturbating, with hoarding rubbish or with tearing his clothes. Again, others may refrain from any attempt at compensation, and then present themselves as the simple and inoffensive type of defectives. For obvious reasons this is more likely to be found on the lower than on the upper end of the scale, and this precisely has been revealed by the present survey.

This tentative psychological interpretation of our findings gives at the same time a pointer to the treatment of the delinquent defective. It suggests that the greater incidence of delinquency in patients of higher grades is a feature of promise rather than of despair. Indeed, it may well be regarded as the only evidence of something like a tendency to self-healing in the field of mental deficiency. The low grade defective who has not got "wits" enough to become a delinquent exhibits only a rudimentary tendency in this direction. The defective of high grade shows, by contrast, plenty of this tendency. Actually so much of it that he is likely to overstep his mark and thus to defeat his own purpose. Accordingly, his treatment must be determined by two basic principles. First, we must relieve his sense of inferiority for this is, on the ground of our hypothesis, the main factor that may tip the balance of his behaviour at a given level of the intelligence scale in favour of delinquency. Secondly, we must reduce, as far as this is possible, his real shortcomings, since they are the primary sources of his persistent failures in life.

To achieve our first objective, we have to remove him from his ordinary environment and place him under the sheltered conditions of an institution. Here he is relieved from the unequal task of asserting himself against overwhelming odds in the outer world. He has no longer to try to compete with his fellows on unequal terms. He has to compete with defectives of his own grade, and often with patients below his level of intelligence. This may in turn give him the opportunity of asserting himself on a level of unchallenged superiority, and help him to restore his self-respect without resorting to artful tricks or dodgery.

On the other hand, it need not be emphasized that the judicious control of the patient's tendency to compensation and over-compensation, its direction into the right channels, is another important feature of his proper management. This naturally requires a firm disciplinarian regime, and cannot be achieved without occasional resort to punishment. But in doing so we must avoid pouring fuel into the fire by further increasing his sense of inferiority, and apply punishment in such a way that it does not leave a sting behind. In fact, its administration and dosage should be subject to the same consideration and restrictions as the use of medicines falling under the Dangerous Drug Act.

Our second objective is being pursued by the patient's special tuition, followed by training in various trades and occupations. These must be carefully adjusted to his limited abilities, and designed in such a manner that they provide him with the necessary physical outlets. At the same time they should give him at least a

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foretaste of the feeling derived from work well done, and from such small rewards as he may receive for his labours. To this comes the beneficial effect of the various recreational outlets, such as mixed dances, competitive sports in which the higher grades can distinguish themselves and carry "all the prizes"; in short, all the paraphernalia of life within a well organized modern institution. Indeed, life in a colony for the mentally defective run along these lines represents the closest approximation of full adjustment of the patient to his environment. It provides him with natural outlets within his own community, it gives him the semblance of a biologically balanced existence in a quasi-natural social setting, and is therefore best suited to his needs and capabilities. The success of the present system of outside employment and licence of defectives of both the delinquent and the non-delinquent group is the best proof of the efficiency of the methods described.

But two provisos must be made. First, the delinquent defective admitted to an ordinary institution should not be of too high a grade. In the region of an I.Q. above 80 he is likely to resent his detention to such a degree that this is bound to outweigh all the benefits which he may derive from the factors outlined here. Furthermore, it goes without saying that there must be a point of saturation beyond which it is not advisable to increase the proportion of the delinquent to the non-delinquent defective in a given community. The proportion of nearly 1 : 3 recurrent offenders illustrated by Chart 1 marks about the limit of what can satisfactorily be dealt with in colonies of the ordinary type. In any case a continuation of the present rate of admission of patients of this class is bound seriously to upset the balance between the delinquent and non-delinquent groups, and may call for new administrative measures.

I wish to thank the Joint Committee of Management of the Institution for facilitating the publication of this paper.

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COMMENTS ON THE SHIPLEY-HARTFORD VOCABULARY TEST.

By E. J. G. Bradford.

[Received 16 July, 1944.]

Though English is the language of the citizens of the U.S.A., it would be rash to assume that their reading vocabulary was identical in its familiarity with that of the citizens of the British Isles. Hence it is possible that a vocabulary test which is suitable for discriminating among adults in the U.S.A. may not be as suitable for that purpose among adults in this country. A critical examination of the Shipley-Hartford test seems called for, in order that the test may be used with success on this side of the Atlantic.

This test has been applied, along with other psychological tests, to 90 male patients at a neurosis centre. These patients were finally diagnosed as hysterics or psychopaths in the majority of cases, though some were in the categories of mental defective or of head injury.

It was found that generally speaking the order of presentation in the list of words was the order of difficulty; there were, however, some marked exceptions to this general rule. In Table I below the words are grouped according to the difference in rank as between order of presentation and order of difficulty:

Table I.

Difference.	Words from the list.
0.	Talk. Lissom. Temerity. Pristine.
1.	Permit. Pardon. Tumble. Facilitate. Amulet. Orifice.
2.	Remember. Evident. Impostor. Caption. Jocose. Apprise. Denizen. Mollify. Pariah. Querulous.
3.	Merit. Fascinate. Hilarity. Smirched. Rue. Abet.
4.	Couch. Ignorant. Renown. Narrate. Divest. Serrated. Plagiarise.
5.	Fortify. 6. Hideous. 7. Indicate. 8. Inexorable. 9. Squander. 10. Cordial. 11–12. Massive.

The test was given during an interview. The patients were asked to read aloud the word in the first column, and then the word with the same or similar meaning chosen from one of the four words on the same line. It was soon discovered that misreadings accounted for some errors of choice, and that when the correct pronunciation of the first word was given them, the correct choice was made. (Under such circumstances they were not credited with a correct solution.) The words most frequently misread were:

couch	read as	cough
tumble	,,	tumbler
hideous	,,	high deus
caption	,,	captain
cordial	,,	caudal

A second influence which undoubtedly affected the choice was similarity of

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form or of sound. Occasionally this led to error, but in other cases it probably led to success, thus:

Errors.		*Successes.*	
fascinate	fix	remember	recall
inexorable	involatile	divest	dispose
pariah	priest	mollify	mitigate
temerity	timidity		

During a period of war the word " fortify " will be more familiar than in times of peace. Similarly, after having seen on every advertising hoarding the illustrated exhortation to avoid " waste " and eliminate the " squander " bug, the association of the two words has become very strong.

For extreme accuracy a long word list is undoubtedly better than a short one, but to present a sick man with the task of examining a page of two hundred words is an implicit encouragement to exhibit some symptom of the Effort Syndrome. For clinical purposes, especially when the time is strictly limited, a shorter list might serve as well if not better. By omitting the words which are likely to be misread, those which the times have made unusually familiar and therefore less discriminative, and those words which have a marked differential familiarity in the two countries, a list can be produced that gives a high correlation with the original, and one which at the same time is more appropriate for use in the British Isles. The percentage of successful responses to the individual words in such a shortened list are given below:

TABLE II.

Talk	100	Hilarity	69	Apprise	25
Permit	94	Renown	60	Denizen	23
Impostor	88	Narrate	52	Lissom	18
Fortify	85	Facilitate	42	Pariah	17
Evident	84	Rue	41	Querulous	17
Merit	73	Jocose	32	Temerity	5
Fascinate	71	Serrated	26		

The method of scoring recommended by the authors of the test is open to criticism. They recommend that one-quarter of the words unattempted should be considered as correct and added to the score obtained by correct answers. This method of scoring is based upon the false assumption that those unattempted would be *guessed* correctly once in four times, because there are four alternatives to choose from. Statistically that might be correct procedure for independent associates, but psychologically it is incorrect to assume that the possible associates are all independent. Guessing is biased both by the form and the sound of the words. Secondly, if three of the five words are well known, there is a likelihood that the two unfamiliar words will get linked together. The choice is not a matter of pure chance. Hence, a straightforward total of the successful responses will probably give a sounder psychological verdict.

The relation between the scores obtained from the full original test and the scores obtained from the shortened list is very close, r = ·95, and since the shortened version omits several of the doubtful features of the original, it may even be a more accurate instrument of measurement. Scoring on the basis of the total number of correct responses the comparative ranges of score obtained were:

Original test.		*Shortened test.*	
Mean score	21	Mean score	10½
75 percentile	28½	75 percentile	13½
25 ,,	14	25 ,,	6½

For individual testing it is recommended that the test paper be placed before the subject, and that the tester read the instructions and the example aloud before the subject is asked to start on the first word in the list. It has been found that a time allowance of five minutes is usually ample. An examination of the shortened version given below will show that very few modifications have been made.

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The Shortened Test.

The word in the first column has nearly the same meaning as one of the other four words on the same line.

Read aloud the first word in the line, and then tell me which other word has the same meaning, thus: *Large*: red—silent—big—wet (large = big).

1. *Talk*	draw	eat	speak	sleep
2. *Permit*	sew	allow	cut	drive
3. *Evident*	green	afraid	obvious	sceptical
4. *Impostor*	inspector	officer	conductor	pretender
5. *Fortify*	strengthen	submerge	justify	deaden
6. *Merit*	distrust	fight	deserve	separate
7. *Fascinate*	welcome	enchant	similar	stir
8. *Hilarity*	laughter	speed	malice	mountainous
9. *Renown*	length	funny	fame	loyalty
10. *Narrate*	yield	buy	associate	tell
11. *Facilitate*	strip	help	chemical	bewilder
12. *Rue*	dominate	lament	cure	foreign
13. *Jocose*	humorous	race	paltry	fervid
14. *Serrated*	dried	notched	angry	blunt
15. *Apprise*	reduce	open	delight	inform
16. *Denizen*	senator	inhabitant	atom	twelve
17. *Lissom*	mouldy	loose	supple	flower
18. *Pariah*	outcast	priest	ancestor	lentil
19. *Querulous*	maniacal	devout	curious	complaining
20. *Temerity*	rashness	timidity	kindness	deserving

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Part II.—Reviews.

Bradley's Dialectic. By RALPH WITHINGTON CHURCH, D.Phil. London: George Allen & Unwin, Ltd., 1942. Pp. 188. Price 10s. 6*d*.

In this book an attempt is made to set out the essential features of Bradley's dialectic and also to subject some basic difficulties to criticism.

Bradley's idealistic monism conceives reality as an absolute whole, within which all self-discrepancy is resolved. This absolute is not and never can be available to finite minds. The finite mind can only have access to the world of appearance, consisting of qualities and their relationships. It is essential to Bradley's dialectic that relationship should be conceived as being both external, and at the same time internal to the terms they relate.

Bradley's views concerning judgment and error should be of interest to psychiatrists. By judgment, it is stated, a more complete coherence of relationships is obtained, and so an approach is made towards the Absolute, the true, the real. Church notes that, on Bradley's own showing, the Absolute is not available to finite minds, which leaves the latter with no criterion of truth and reality beyond Appearance. Again, according to Bradley, coherence of a relational situation involves intellectual satisfaction, which is an index of increase or decrease of coherence. Therefore, a growth of intellectual satisfaction is the only index of fuller coherence in judgment. Psychiatrists with experience of megalomanic paranoiacs will agree with Church that the validity of this converse is at least doubtful.

Bradley's theory of Error is interesting. It is held that since error is within the world of Appearance, it also must partake of the Absolute. Bradley explains that "error is truth; it is partial truth that is false only because partial and left incomplete."

In a final critical chapter it is shown that Hegelian dialectic can never be used to refute the absolutism of Hume, or *vice versa*. STANLEY M. COLEMAN.

What is Hypnosis: Studies in Auto and Hetero Conditioning. By ANDREW SALTER. New York: Richard R. Smith, 1944. Pp. vi + 88. Price $2.

There is a very adequate description of the hypnotic state and auto-hypnosis as purely physiological events. Hypnosis "is based on association reflexes that use words as the triggers of automatic reactions." Volitional thinking is not involved, and there is therefore no need for such concepts as "suggestion" or "faith." In a word, it is a method of producing the conditioned reflex. The psychological aspects of hypnosis are consistently ignored and, apparently, for a thing to be ignored is equivalent to its absence.

In an appendix there is a description of a technique of auto-hypnosis, by post-hypnotic suggestion, which the author finds of value for therapeutic purposes. He has used it with success in cases of stuttering, nail-biting, insomnia, smoking, etc. He sees in this an "instrument of most fantastic power," and suggests that the mass procedure could be applied to soldiers "to make themselves immune to sounds and pains as they wish. It is not impossible to imagine battalions of self-anaesthetized soldiers going into battle." It occurs to the reviewer that army training is largely a process of conditioning, but attention is paid to both physiological and psychological aspects. STANLEY M. COLEMAN.

Love against Hate. By KARL MENNINGER, M.D. London: George Allen & Unwin, Ltd., 1944. Pp. xi + 511. Price 18s.

In this interesting and provocative work the author covers more or less the same ground as Freud in his *Civilization and its Discontents*. The fact that Menninger's book is written for the lay reader may partly account for an optimistic outlook on the future of the human race, in sharp contrast to the pessimism of Freud.

Menninger admits that there is something seriously wrong with the civilization of to-day, and in the first half of the book he attempts to pin down the cause of this on to some body or some thing. It is taken as an axiom that the destructive impulse is a bad thing, which must be checked or diverted, while the creative or erotic instinct is a good thing, which, in our civilization, suffers too much repression. People, we are told, are as they are because their infancy and childhood have been mismanaged. Looking for a cause for this state of things the onus is placed fair and square upon the mother's shoulders: her unsublimated destructive impulses have denied to the child the natural expression of its sexual desires. The mother in her turn is as she is because she has been frustrated as a woman in a man-made civilization. The man, once again, is the inevitable product of a mismanaged training by the mother.

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The second half of the book shows how this vicious circle may be broken. The principle is that the destructive urges should be harnessed to Eros and directed into such socially acceptable activities as work and play, and also directed towards the acceptance of a philosophical outlook based on faith, hope and love.

It is clear both from the text and source notes that the author owes more to Melanie Klein than to Freud. The latter takes the view that erotic gratification is sacrificed for security, and that social and cultural progress depend upon this renunciation. It is this repression of the instincts which provokes hostility among the members of the community towards each other and towards civilization itself. He makes it quite clear that sexual freedom is no cure for man's ills, and that such licence would mean the collapse of civilization. For some readers Menninger's optimistic thesis may seem like a Gounod melody over a Bach prelude.

The author writes with his accustomed verve, and presents clearly and forcibly a point of view which, there is evidence to believe, is held by a large number of psycho-analysts.

STANLEY M. COLEMAN.

Food for Thought: A Treatise on Memory, Dreams and Hallucinations. By BERNARD J. DUFFY, M.A. London: Longmans, Green & Co., Ltd., 1944. Pp. 160. Price 10s. 6d.

The author holds that modern science and psychical research conclusively show that the brain is an electrical machine employed by the soul for the purpose of receiving and transmitting impulses, which are experienced as perceptions. The soul or mind is able to exert an action on the brain and body through the medium of a third substance, the pneumatical body or "ether." Extra-sensory perceptions may also be picked up telepathically in certain cases. Dreams and hallucinations, for instance, may be due to conditions within the body, or they may come from without telepathically. The author supports his theory by relating his own telepathic experiences.

Alternative theories on memory, dream and hallucination are dismissed with vituperation. Psycho-analysts are told that they consistently ignore the findings of modern physiology and that they have no scientific theory to offer; there is reference to cesspools and cauldrons. Behaviourists learn that their "fantastic theory" has been exploded. "Kohler seems to be so fascinated by his own dexterity in word-spinning that he ignores logic and consistency." Huxley confuses memory and consciousness. Bleuler's theory is not supported by empirical evidence and is regarded as an ingenious speculation.

STANLEY M. COLEMAN.

A Text-book of Psychiatry. By D. K. HENDERSON and R. D. GILLESPIE. Sixth edition. London: Humphrey Milford, Oxford University Press, 1944. Demy 8vo. Pp. 719. Price 25s.

This well-known text-book still remains the best text-book of psychiatry published in this country. For the most part it is very well done, but there are irritating errors of proof-reading. On p. 150 appears a reference by E. Slater in the *Journ. Neurol. and Psychopathol.*, 1943. This journal, as surely all psychiatrists know, became the *Journ. of Neurology and Psychiatry* in 1938, and became, with the January–April issue of 1944, the *Journ. of Neurology, Neurosurgery and Psychiatry*. The same error is repeated on p. 420. On p. 414 appears a reference F. E. Ebaugh, *Annals of Internat. Med.*, 1943, **18**, 249—this would appear to be F. *G.* Ebaugh, *Annals of Internal Med.*, 1943, and incidentally it is p. 279, not 249!

On p. 573 the *Bulletin of the Menninger Clinic* is referred to as the *Bulletin of the Klenninger Clinic*, and the Haufmann-Kasanin test is surely the Hanfmann-Kasanin test!

On p. 421 appears again under a reference what sounds an intriguing form of treatment, to wit "Noveoanalysis," but this is surely the printer's devil at work on "Narcoanalysis"! Would the authors welcome exorcism?

The authors discuss the work of Mott on the testis and ovaries, and the adverse criticisms of Morse. It would have been helpful if the recent work of Hemphill and Reiss on biopsy of the testis in young schizophrenics could have been included here.

We beg to differ very strongly indeed from the authors' concluding remarks on prefrontal leucotomy: "the possibility of serious and permanent damage to the mental functions makes it necessary to reserve the method for cases where all other suitable methods of treatment have been tried and failed; where the illness offers no reasonable hope of spontaneous recovery, and where the patient is disabled more or less completely from useful occupation or from modest enjoyment of his life." It has *not* been shown that there is any serious damage to the mental functions after leucotomy. There are those who regard leucotomy as a "suitable" method of treatment, and indeed preferable to shock treatment.

The treatment of chronic alcoholism yields such unsatisfactory results that a detailed account of the conditioned reflex treatment—which the authors merely mention in two lines—would have been a great help to those who have to deal with a chronic alcoholic and wish to have something concrete to work on.

The account of intelligence tests is well done, but we think that the work of Brody in this country might well have been mentioned.

The lay-out of some of the chapters has been altered, but this is described by the authors in their preface.

G. W. T. H. FLEMING.

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An Introduction to Physical Methods of Treatment in Psychiatry. By WILLIAM SARGANT and ELIOT SLATER. Edinburgh: E. & S. Livingstone, Ltd., 1944. Pp. xii + 171. Price 8*s.* 6*d.*

It would be difficult to imagine a book with more hard common sense and clinical acumen crammed in between its covers. The authors represent the Maudsley tradition at its best, and the spirit of Henry Maudsley must be well satisfied with the harvest reaped from the seed he sowed.

Quite one of the best chapters is that on chemical sedation and stimulation. The attitude of the authors is aptly stated—"We must be prepared to give the patient what he needs when it is clear that he needs it and not be dissuaded by illusory dangers. Especially is this the case when psychotherapy and environmental readjustment have failed to produce substantial benefit."

Their remarks on bromide intoxication are sound and very much to the point. Bromide therapy to-day is a scientific procedure, and the reviewer shudders when he recalls how, twenty years ago, he gaily gave an elderly lady 180 gr. of sodium bromide three times a day for some days. The expression "heroic" doses so often means ignorant doses!

In discussing prefrontal leucotomy the authors state—"In some hospitals these patients are treated by operation in preference to electric convulsion therapy. This does not seem right, as the latter is by far the less serious form of interference." With this opinion the reviewer, after three years' experience of both treatments, begs to differ. The ill-effects of leucotomy are not so serious as we have been led to believe, and electric convulsion therapy is not *quite* the brilliant success originally claimed for it.

In discussing the treatment of schizophrenia by leucotomy the authors wisely emphasize the beneficial effect on hallucinated patients. This can be so marked that a certain physiologist referred to leucotomy as a "hallucinectomy." The relation of psychological to somatic treatment is well summed up: "The organic causation of apparently psychogenic symptoms is very easy to miss clinically. Only in recent years have physicians acquired sufficient knowledge to become suspicious of the neurotic symptoms of pre-clinical pellagra." This statement is the keynote to the whole book. It is only by a really wide knowledge of general medicine and its ancillary subjects of biochemistry, endocrinology, physiology and pharmacology that the psychiatrist can hope to make advances in diagnosis and treatment. Psychiatry is making rapid strides, but is at the same time demanding a very high standard of general medicine.

This book should be read and re-read, and we look forward to a second and larger edition at an early date, and perhaps more than an introduction. G. W. T. H. FLEMING.

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Part III.—Bibliography and Epitome.*

An attempt is being made to provide as far as possible a complete bibliography compiled from the specialist journals dealing only with Psychiatry and Neurology (which are really inseparable) and their ancillary subjects, psychology, anatomy of the nervous system, criminology, etc.

A number of titles may appear to have a very remote relation to psychiatry, but they are included for the sake of completeness.

If any reader can add the names of journals to the following list, which it is hoped to publish each year in the January number, the addition will be gratefully received and acknowledged.

Those journals which are available in the Library of the Royal Medico-Psychological Association are marked " 1," those available in the Library of the Royal Society of Medicine are marked " 2," those in the Library of the British Psychological Society are marked " 3," and those in the Library of the British Medical Association are marked " 4."

The titles of these journals are mostly in the form given by the Board of Editors of Publications of the American Psychological Association, January, 1939. Contributors are requested to use the exact form given below.

PSYCHIATRIC JOURNALS.

Abh. Neur. Psychiat.
Abh. Psychother.
Acta Española Neur. y Psiquiat.
2, 4 *Acta Psychiat. et Neurol.*
3 *Acta Psychol., Hague.*
Acta Psychol., Keijo.
Aliéniste Français.
2 *Allg. Ztschr. f. Psychiat.*
Altersprobleme.
Am. Imago.
Am. J. ment. Def.
2, 3 *Am. J. Orthopsychiat.*
1, 2, 3, 4 *Am. J. Psychiat.*
2, 3 *Am. J. Psychol.*
An. Bras. Hig. Ment.
An. Istit. Psicol. Univ. B. Aires.
An. Psicotec., Rosario.
Anal. Inst. Neurol. Montevideo.
Analele Psihol. (Rumania).
Anales de psicologia, Buenos A.
2, 3 *Année Psychol.*
2 *Ann. Méd. Psychol.*
2 *Ann. Osp. psichiatri., Perugia.*
Arb. Psychiat. Inst., Sendai.
Arch. Anthrop. crim.
2 *Arch. Argent. de Neurol.*
Arch. Argent. Psicol. norm. pat.
2 *Arch. Bras. de Neur. e Psiquiat.*
Arch. Brasil Hig. Ment.
Arch. Chilenos de Crim.
Arch. Ital. di Studi Neuropsich.
1, 2 *Arch. Neurobiol.*
4 *Arch. Neurol., Paris.*
Arch. de Neurol. de Bucarest.
1 *Arch. de Neurol.*
2 *Arch. di Antropol. Crim.*
Arch. di Criminol. Neuropsiquiatria y Disciplinas Conexas, Quito.
2, 4 *Arch f. Psychiat.*

* A number of abstracts in this section are reproduced from *Chemical Abstracts and Psychological Abstracts*. To the Editors of these two Journals we extend our grateful thanks.

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2, 3 *Arch. ges. Psychol.*
Arch. Internationale de Neurol.
Arch. Ital. Psicol.
Arch. Krim. Anthrop.
1, 2, 3, 4 *Arch. Neurol. Psychiat.*
Arch. Neur. Psychiat., Mex.
2, 3 *Arch. Psicol. Neurol. Psichiat. e Psicoter.*
2, 3 *Arch. Psychol., Genève.*
3 *Arch. Psychol., N.Y.*
Arch. Relig. psychol.
Arch. Speech.
Arquivos da Assist. a Psicopatas de Pernambuco.
Arq. de Neuro-psiquiat., Brasil.
3 *Austr. J. Psychol. Phil.*

Beih. Z. angew. Psychol.
Beih. Zbl. Psychother.
Bol. Inst. Psiquiatria, Rosario.
2, 4 *Brain.*
3 *Brit. J. Educ. Psychol.*
2, 4 *Brit. J. Inebriety.*
2, 3, 4 *Brit. J. Med. Psychol.*
2, 3, 4 *Brit. J. Psychol.*
3, 4 *Brit. J. Psychol. Monogr. Suppl.*
Bull. Canad. Psychol. Ass.
2, 4 *Bull. de la Soc. de Psychiatrie de Bucarest.*
2 *Bull. de la Soc. Roumaine Neur. Psychiat. Psychol. Endocrin.*
Bull. du Groupement Français d'études de neuro-psychopathologie infantile.
2 *Bull. Los Angeles Neur. Soc.*
Bull. Menninger Clin.
Bull. Soc. Psihol. med., Sibiu.

4 *Canad. Journ. Occup. Ther.*
3 *Cath. Univ. of Amer. Studies in Psychol. and Psychiat.*
2 *Cervello.*
2, 3, 4 *Character and Per.*
2 *Child Develpm.*
Child Develpm. Abstr.
Child Develpm. Monogr.
Child Study.
Chin. J. Psychol.
3 *Comp. Psychol. Monogr.*
2 *Confinia Neurol.*
Contr. del Lab. di Psichologia.
Contr. psychol. Theor.
Criança Portuguesa.

2 *Deutsche Ztschr. f. Nervenh.*
Dis. Nerv. Syst.

Educ. psychol. Measmt.
1, 2, 3, 4 *L'Encéphale.*
2 *Epilepsia.*
Evolut. Psychiat.

Fiziol. Th. S.S.S.R.
2 *Folia Neuropath. Esthon.*
2 *Folia Psychiat. et Neurol. Japonica.*
2 *Fortsch. Neur. Psychiat.*

3 *Genet. Psychol. Monogr.*
Giornale di Psich. e di Neuropat.

4 *Hum. Factor.*
2, 3, 4 *Hyg. Ment.*

Illinois Psychiat. J.
Index Neurol. y Psiquiat., Buenos Aires.

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3 *Indian J. Psychol.*
Industr. Psychol.
Industr. Psychotech.
1, 2, 3, 4 *Int. J. Psychoanal.*
2, 3 *Int. Z. Psychoanal. u. Imago.*

Jap. J. appl. Psychol.
Jap. J. Exp. Psychol.
Jap. J. Psychol.
1, 2, 3 *J. Abnorm. Soc. Psychol.*
J. Am. Soc. Psychic. Res.
3 *J. App. Psychol.*
2, 4 *J. Belge Neur. Psychiat.*
2 *J. Comp. Neur.*
1, 3 *J. Comp. Psychol.*
J. Consult. Psychol.
J. Crim. Law and Criminol.
J. Crim. Psychopathol.
J. de Psychiatrie Infantile.
3 *J. Educ. Psychol.*
J. Except. Child.
3, 4 *J. Exp. Psychol.*
2 *J. f. Psychol. u. Neurol.*
3 *J. Gen. Psychol.*
J. Genet. Psychol.
J. Juvenile Res.
1, 2, 3, 4 *J. Ment. Sci.*
1, 2, 3 *J. Nerv. Ment. Dis.*
1, 2, 3, 4 *J. Neurol. Neurosurg. Psychiat., London.*
J. Neuropath. and Psychiat., Leningrad.
1 *J. Neuropath. Ex. Path.*
2, 4 *J. Neurophysiol.*
J. Neuropsychiatrique du Pacifique.
J. Neurosurg.
J. Parapsychol.
J. of Psychical Research.
J. Psihoteh.
2 *J. Psycho-Asthenics.*
3 *J. Psychol.*
J. Psychol., Moscou.
J. Psychol. Neurol., Leipzig.
2 *J. Psychol. Norm. Path.*
J. Soc. for Psychical Research.
3 *J. Soc. Psychol.*
J. Speech Disorders.

Kriminalistik.
3 *Kwart. Psychol.*

Mag. psychol. Szle.
Ment. Health.
Ment. Health Obs.
2, 4 *Ment. Hyg., Lond.*
Ment. Hyg., N.Y.
Ment. Hyg. Rev.
Ment. Hyg. Bull., Indiana.
3 *Mind.*
Mschr. Krim. Biol.
2 *Mschr. Psychiat. Neurol.*

Ned. Tijdschr. Psychol.
2 *Neopsichiatrica.*
2 *Nervenarzt.*
3 *Neue psychol. Stud.*
Neurbiol., Pernambuco.
Nevrasse.
Nevropath. i. Psikhiat.
Note e Riv. di Psichiat.
Nowiny Psychjaryczne.
Nuova Riv. di Clin. ed Assistenza Psichiatrica.

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Obshch. Klin. Nevropat.
3 *Occup. Psychol.*
2 *Occup. Ther. and Rehabil.*
2 *Onderzoekingen Psychiat-Neur. Klin., Utrecht.*
2 *Ospedale Psichiatrico.*

Person. J.
Pisani.
Polsk. Arch. Psychol.
Prace Psychol.
Proc. Amer. Assoc. Stud. Ment. Def.
Proc. A. Research Nerv. and Ment. Dis.
Psicholec.
Psicoterapia (*Cordoba*).
Psyche, Cambs., Mass.
Psychiat. Monogr.
2 *Psychiat. en Neurol. Bl., Utrecht.*
2 *Psychiat. et Neurol. Japonica.*
2 *Psychiat. Neurol. Wchnschr.*
Psychiatry.
1, 2, 4 *Psychiat. Quart.*
2, 3 *Psychoanal. Quart.*
1, 2, 3 *Psychoanal. Rev.*
2, 3 *Psychol. Abstr.*
3 *Psychol. Bull.*
Psychol. Clin.
Psychol. Exch.
3 *Psychol. Forsch.*
Psychol. Index.
Psychol. Monogr.
Psychol. Rec.
3, 4 *Psychol. Rev.*
3 *Psychol. Rev. Monographs.*
Psychol. Stud. Univ. Bp.
Psychol. wychow.
3 *Psychometrika.*
Psychometr. Monogr.
Psychosom. Med.
Psychosom. Med. Monogr.

Quart. J. Speech.
Quart. J. Stud. Alcohol.

Rass. Neurol. Veget.
Rass. Studi Psichiat.
Rev. Argent. Neurol. Psiquiat.
Rev. de Psicoanal., Argentina.
Rev. di Neur. e Psychiat., S. Paolo.
Rev. di Psiquiatria, Chile.
Rev. di Psiquiatria y Crim.
3 *Rev. Franç. Psychoanal.*
Rev. Ibero-Amer. de Anal. Biblio. de Neurol. y Psiquiat.
Rev. Méx. Neurol. Psiquiat.
1, 2, 4 *Rev. Neurol.*
Rev. Neurol. de Buenos-Aires.
Rev. Neurol. Psychiat., Praha.
Rev. Neuro-psiquiatr., Lima.
Rev. Oto-Neur.-Oftal. Cir. Neur. Sud-Am.
Rev. Neuropsiquiatr.
Rev. Psicol. Pädag.
Rev. Psihol.
Rev. Psiquiat. Crim., B. Aires.
Rev. Psiquiat., Uruguay.
Rev. Psiquiat. y Disc. Con., Chile.
Rev. Sudam. Psicol. Pedag.
Rev. Tchèque de Neurol. et de Psychiat.
Ricerca Psichica.
2, 3, 4 *Riv. di Neurol.*
Riv. di Neuro-psiquiatria, Peru.
3 *Riv. di Psichologia.*
Riv. Ital. di Endocrin. e Neurochir.

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2 *Riv. Patol. nerv. ment.*
Riv. Psichol. Norm. Pat.
2, 4 *Riv. Sper. Freniat.*
1 *Rocznik Psychjatryczny.*
Rorschach Res. Exch.

1 *Schizofrenie.*
2 *Schweiz. Arch. Neurol. Psychiat.*
Skand. Arch. Psychol.
Sovet. nervropatol., psichiatri, psichoguoguia.
Sovet. Psichoneurol.
Sovet. Psikhotekh.
Speech Monogr.

Tohoku Psychol. Folia.
Tr. Am. Neurol. A.
Tr. Beritov. Inst., Tiflis.
Tr. Kostchenko Ment. Hosp., Moscow.
Trud. fiziol. Lab. Pavlova.
Trud. tsentral. psikhonevrol. Inst.

Univ. Calif. Publ. Psychol.
Univ. Iowa Stud. Psychol.
Untersuch. Psychol. Phil.

3 *Z. angew. Psychol.*
Z. Arb. Psychologie.
Z. Berufsbildung des Pflegepersonals.
Z. Individ. Psychologie.
2, 4 *Z. ges. Neurol. Psychiat.*
3 *Z. Pädag. Psychol.*
Z. Parapsychol.
Z. Psych. Hyg.
Z. Psychoanalyse (Tokyo).
3 *Z. psychoanal. pädag.*
2, 3 *Z. Psychol.*
Z. Psychother. med. Psychol.
Z. Tierspsychol.
2 *Zbl. Neurochir.*
1, 2 *Zbl. ges. Neurol. Psychiat.*
Zbl. Psychotherap.

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Motion Picture Studies of Children with Multiple Handicaps. *Harrison, D. G.* . . 296
Services of the Specialist in Guidance and Placement of the Mentally Retarded. *De Prospo, C. J.* 299

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Psychiatric Observations on the Tunisian Campaign. *Spiegel, H. X.* 381
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Prolonged Insulin Coma in Treatment of Schizophrenia.

An evaluation of the data in 51 cases of prolonged coma occurring in 38 patients during the course of insulin shock therapy leads to the assumption that some factor within the patients themselves, rather than the technic of treatment alone, was responsible for those prolonged comas.

A method suggested for the management of this complication is based on the experience gained in treating these patients, and the physiologic soundness of this method rests on a presented explanation of the mechanism of this complication. With emphasis on the dynamic nature of the action of insulin shock and insulin shock stupor progressing to the irreversible phase of prolonged coma and with free use of the contemporary literature, an attempt is made to explain the varying pathologic pictures in the light of progressive cellular hydration.

(Authors' abstr.)

Fatal Circulatory Failure Caused by Electric Shock Therapy.

There are probably at least two mechanisms by which fatal circulatory failure may be precipitated by electric shock therapy. In the first the acute cardiac dilatation and failure are

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caused by the tremendous muscular exertion of the convulsion. The likelihood of such an occurrence undoubtedly bears a direct relation to the severity of already existing heart disease. In the second the circulatory failure may occur without recognizable heart disease, and possibly results from the electrical stimulation of hyperexcitable central cardio-regulatory or vasomotor centers. The existence of this mechanism should be regarded as hypothetic rather than proved.

Of 3 patients who died of circulatory failure after electric shock treatment, 2 had advanced arteriosclerotic heart disease and the other acute myocarditis.

Electric shock therapy of persons with heart disease or of persons suspected of unusual susceptibility to disturbances of the central vasomotor or the central cardiac centres should not be undertaken without full realization of the potential hazard. (Author's abstr.)

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The EEG of Criminals.

In a study of the EEG of 411 prisoners, including " normal " criminals, psychotic and psychopathic criminals and offenders with " organic " disease, the most significant observation was the high percentage (75) of borderline and abnormal patterns among the psychopathic criminals. The EEG is a potentially important tool in the study and management of the psychopath, but not of the normal criminal. (Author's abstr.)

Synthesis of Hippuric Acid in Dementia Praecox.

Studies of the rate of synthesis of hippuric acid and of concomitant changes in the excretion of uric acid and in the levels of pyruvic and lactic acids in the blood of 18 schizophrenic patients and in 9 normal control subjects revealed that the average amount of hippuric acid synthesized in four hours was approximately the same in the two groups. Three schizophrenic patients synthesized amounts considerably less than the lowest value for the normal subjects, while 3 patients exceeded the range of the normal subjects. Unlike the normal group, several of the schizophrenic patients showed initial retardation of the rate of synthesis and 2 patients excreted unusually large amounts of hippuric acid during the first hour of synthesis. The ingestion of sodium benzoate caused a retention of uric acid which was slightly higher in the patient group. The synthesis of hippuric acid was accompanied by changes in the level of pyruvic acid of the blood. These changes were somewhat correlated with the intensity of the synthesis.

(Authors' abstr.)

Abolition of Bulbocapnine Catalepsy in the Cat by ac-tetrahydro-β-naphthylamine.

A state of catalepsy was produced in cats by the administration of bulbocapnine. A state of excitement and stimulation of the sympathetic nervous system was produced by the administration of ac-tetrahydro-*B*-naphthylamine. The cataleptic state produced by bulbocapnine was completely abolished by the administration of ac-tetrahydro-β-naphthylamine. When bulbocapnine and ac-tetrahydro-β-naphthylamine were administered simultaneously in proper dosage, no symptoms characteristic of either drug appeared, the animal behaving in a normal manner throughout the period of observation. (Author's abstr.)

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Histamine Content of the Blood during Insulin Shock Therapy.

In a study of the histamine concentration in venous blood during various clinically recognizable phases of the insulin reaction in six psychotic patients receiving insulin shock therapy, it was found that values for histamine in whole blood before the administration of insulin corresponded closely to those reported by other investigators for normal persons. Early in the insulin reaction a slight rise in the histamine level of the blood was observed. The concentration of histamine increased, together with the depth of shock, late in the insulin reaction, reached its peak during the period of deepest shock, and returned toward normal after the reaction was interrupted by intravenous administration of dextrose. Values for the concentration of histamine with plasma, though less than those for whole blood, apparently fluctuated in similar fashion. The average maximal increase in the histamine concentration of the blood was 456 per cent. for all patients; the average maximal increase for patients in deep shock was 684 per cent. Changes in the histamine level corresponded to spontaneous fluctuations in depth of shock. Administration of a small amount of dextrose intravenously to one patient reduced the depth of shock and the histamine level concomitantly. Comparison of histamine levels during subshock, medium shock and deep shock revealed that the concentration of histamine with circulating blood apparently corresponded to the intensity of clinical shock observed during the insulin reaction. (Authors' abstr.)

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Electroencephalographic Changes Due to Cerebral Trauma.

1. The place of electroencephalography in the study of head injury is similar to that of other laboratory procedures and, to be most useful, must be interpreted in the light of clinical manifestations.

2. In patients with cerebral "concussion" there is first a momentary absence of cerebral

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electrical activity, followed by runs of slow waves suggestive of cortical depression. The return of normal wave pattern is gradual during a ten- or fifteen-minute period immediately following the concussion.

3. Cerebral contusions of the coup-contrecoup type are often multiple and extensive. In these cases multiple lesions may give rise to a disturbed electrical pattern closely simulating diffuse cerebral dysrhythmia. If repeated tracings are taken during the course of recovery most of the lesions can be localized and their progress followed to complete clinical recovery, or a residual cortical defect may be demonstrated at a later date.

4. Extradural and subdural hemorrhages produce similar electroencephalographic changes characterized by low potential waves over the site of the lesion and slow waves of high voltage, and occasionally spikes at the margin of the lesion. The low potential activity has been considered due to short-circuiting of the waves by the accumulation of blood or fluid. In some other cases the low potential may be due to complete functional depression of cortical cells beneath the hematoma.

5. Gunshot wounds and other penetrating injuries of the brain may produce damage in areas far removed from the point of entrance of the missile. The extent of this distant damage may be well outlined electrographically.

6. Post-traumatic epilepsy may be due to irritation from a focal scar, or in other instances due to an inherent dysrhythmia in which the injury is merely a precipitating mechanism. It is possible in some cases to differentiate between the two types by electroencephalography.

7. Electroencephalographic study in doubtful cases may be of definite help in proving or disproving the presence of cerebral damage in minor head injuries. This type of study should be of value in industrial accidents where there is a question of compensation.

(Author's abstr.)

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The Physical Examination of Two Thousand Cases of Neuroses.

Of 2,288 consecutive admissions to a military hospital for neurosis, 3·4 per cent. had organic disease. The mean blood pressure of the remainder was found to be higher than accepted normal. The anomalous results of exercise tolerance test which were found are probably due to nervous factors. A list of the factors which may lead to the location of psycho-somatic symptoms is given. (Author's abstr.)

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*Reaction of Monkeys of Various Ages to Partial and Complete Decortication. *Kennard, M. A.* 289

Neurohistologic Findings in Experimental Electric Shock Treatment.

Cats were given electro-cerebral shock; one group with the faradic current of Berkwitz, the other with the Cerletti-Bini type of house current. The experiments were conducted in close imitation of human electro-shock therapy, and in two animals excessive doses were given intentionally. The nutritional aspects of the animals were carefully controlled.

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Careful histologic studies of the brains and cords of all experimental animals were made, many on serial sections. No morphologic changes were observed in those animals receiving convulsive doses analogous to those given in humans. In the two animals receiving excessive electric shock doses, one small area of pericapillary hemorrhage was seen in one, and congestion of the smaller vasculature was observed in the other. In no case were subarachnoid hemorrhages or diffuse or extensive intracerebral hemorrhages encountered.

Explanations for the vascular changes reported in the literature in similar experiments are offered. (Authors' abstr.)

Alterations in Brain Structure after Asphyxiation at Birth.

Experimental Cesarean sections were performed under local anaesthesia in guinea-pigs at term. Asphyxia was induced by occluding the uterine or umbilical circulation of more than 70 fetuses; 50 litter-mate fetuses were delivered for controls without asphyxiation. Sixty-six of the newborn guinea-pigs were resuscitated and lived 30 minutes to 13 weeks. Brains of all were preserved and sectioned serially. A controlled method of staining with buffered (pH 4 to 5) solutions of thionin were used. This allowed exact comparison of staining qualities in control and experimental brains.

Multiple capillary hemorrhages and occasionally larger hemorrhages were found in all animals between 3 hours and 5 days after resuscitation, in half between 30 minutes and 2 hours and in none killed by asphyxia. Great variation in the amount of hemorrhage and in its distribution was encountered. Hemorrhage was not the primary cause of extensive neuron damage.

Edema appeared to be present in all but one brain between 8 hours and 4 days after resuscitation. After 5 days it had subsided.

Cytologic changes were observed in all specimens between one and one-half hours and 21 days after resuscitation.

The usual sequence of events was clouding of Nissl granule pattern starting between 1 or 2 hours, swelling of some neurons and shrinkage of others by 3 hours, loss of stainability with thiosin (pH4 to 5) starting at about 5 hours, typical chromatolysis by 1 or 2 days, complete lysis of neurons as early as 4 days, and hyperchromatic staining at least as early as 3 weeks. Some specimens showed generalized changes throughout most of the brain. Others were affected to a marked degree in rather circumscribed regions only. The cerebellum and corpus striatum were not markedly affected, while the thalamus, cerebral cortex, tegmentum and spinal cord were often severely damaged.

Asphyxia induced a transient microglia reaction between 2 days and 3 weeks. Thereafter glia assumed normal proportions.

Generalized or regional atrophy followed the loss of neurons in two-thirds of the severely asphyxiated and half the mildly asphyxiated guinea-pigs. As late as 13 weeks after resuscitation neurons of the experimental brains stained darker and were more shrunken than those of littermate controls. Areas of partial necrosis occurred in 8 animals. Loss of myelinated nerve fibers appeared to be secondary to cell loss.

It can be concluded that experimental asphyxiation followed by successful resuscitation of guinea-pigs at birth produced neuropathologic changes of variable degrees of severity in all specimens studied between one and one-half hours and 3 weeks after birth, and produced detectable permanent structural changes in more than half of those allowed to live more than 3 weeks. (Authors' abstr.)

Reaction of Monkeys of Various Ages to Partial and Complete Decortication.

The reactions following complete or partial decortication in infant and adult monkeys have been described and compared.

The decorticate adult has a motor performance limited to the simpler righting reflexes which alter the posture of its extremities as its position in space is changed. It is moderately spastic and relatively less motile than the decorticate infant.

The infant, decorticate during the first months of life, has a more complex pattern of motor performance. It rights, maintains standing posture and walks spontaneously. All the patterns of the performance, whether sucking, swallowing, vocalizing, clinging or progressing, are more complex and less stereotyped than those of the adult. There is no spasticity. The posture at rest is one of exaggerated flexion. One six-months-old animal, when decorticate, showed behavior intermediate between the above two. It was flaccid and maintained flexor posture. It was, however, unable to right and had the limited performance of the older animals. Removal of the following portions of the central nervous system of infant monkeys was seen to have some effect on reactions at that time, and hence indicates some cortical function at an early age: frontal association areas, areas 8, 6, 4, the parietal areas and the basal ganglia.

Destruction of large parts of the cortex at various ages has confirmed the observation that the infant cortex has a greater capacity for reintegration of motor activity than has the cortex of the adult.

Furthermore, the reorganization of the cortex injured in infancy always follows a pattern which is fixed both by the age of the animal and by the size and site of the lesion. (Author's abstr.)

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Changes in Weight and Neuromuscular Transmission in Muscles of Immobilized Joints. *Thomsen, P., and Luco, J. V.* 245

An Analysis of the Variability of Spinal Reflex Thresholds.

The threshold for reflex muscle contraction on applying moving pressure stimuli to spinous processes is relatively constant in given subjects. There are wide threshold differences among spinous processes in different subjects, and from segment to segment, and from side to side in the same subject. The evidence indicates that these differences might be due (i) to changes in the environment of deep pressure or stretch receptors in medium and high level areas and to that of other end-organs (particularly free nerve-endings) in low threshold areas, and (ii) to an imbalance of excitor-inhibitor influences, such as occurs in an enduring subliminal C.E.S. The mean threshold is slightly but significantly higher on the left side than on the right. No reason for this is evident.

In the absence of organic disease of neuromuscular and other systems, reflex threshold levels might provide a neurologic index of the organism's efficiency in coping with mechanical weaknesses and with environmental stresses. (Author's abstr.)

Parasympathetic Regulation of High Potential in the EEG.

If the inhibition of parasympathetic activity responsible for cardiac acceleration during hyperventilation is also responsible for concomitant slowing of the brain waves, section of parasympathetic pathways to the brain should increase hypocapnic effects.

The facial nerves containing parasympathetic pathways to the pial blood vessels were exposed in cats under ether. The animals were then paralysed with beta-erythroidin and given artificial respiration. Two minute periods of hyperventilation, which had no effect before sectioning the nerves, produced high potential, slow and spiked, activity after one or both facial nerves were cut. Stimulation of peripheral cut ends of the nerves reduced or prevented slow waves. Intravenous physostigmine in low concentration likewise prevented effects of hyperventilation, and atropine exaggerated effects previously counteracted by physostigmine. Atropine, in sufficient concentration, also produced high potential slow and spiked waves during hyperventilation without nerve section.

A parasympathetic influence on the electrical activity of the brain is demonstrated.

A cholinergic influence on cerebral mechanism and cerebral circulation is implied. A supplemental relationship between acetylcholine and carbon dioxide in homeostatic regulation of cerebral circulation is indicated. It is suggested that a neural mechanism is indicated by which emotionally induced, autonomic changes may produce "functional" effects on brain.
(Authors' abstr.)

The Afferent Path of the Pupillodilator Reflex in the Cat.

The pupillodilatation resulting from sciatic, splanchnic and in some instances trigeminal nerve stimulation has been observed after various lesions of the spinal cord and brain in lightly anaesthetized cats. This response is known to result from inhibition of oculomotor constrictor activity; the present study adds the observation that destruction of parts of the brain above the oculomotor nucleus does not impair the effect, which is evidently completed at the midbrain level.

A common intramedullary pathway conveys afferent impulses from each of the sources studied to the midbrain. This pathway ascends through the lateral funiculus of the spinal cord, traverses the reticular formation of the medulla, gains a paramedian position in the dorsal pontile tegmentum, and ascends through the midbrain in or near the ventral central grey of the aqueduct. This oculomotor inhibitory pathway seems to be distinct from the lateral spinothalamic tract throughout its course, and pupillodilatation and pain evolved by stimulating afferent nerves would appear to bear only a coincidental relation to one another.
(Author's abstr.)

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1. Biochemistry, Physiology, Anatomy, Pathology, Psychiatry, etc.

EEG Studies of the Conditioning Mechanisms for Periodic After-images. Motokawa, K. [*Tohoku J. Exp. Med.*, **40**, 48 (1941).]

While acting as subject in Mita's experiment, the author noted that after the alpha waves had been suppressed by a light stimulus, they went through a rather long period of recovery, during which time their amplitude fluctuated until they returned to their normal size. He noticed also that the after-image went through a similar period of fluctuation. He points out that Jasper and Cruikshank noted the same phenomenon. The present article is a further study of this fluctuation. In the curve of the Berger rhythm one notices two superimposed amplitudes, one of 8–15 sec. and one of 40–60 sec. The former coincides with the fluctuations of the after-images; the latter with that of winking. The alpha waves are, in general, suppressed in the after-image phase, and in their place appear delta waves. In the dark intervals between after-images there are alpha wave spindles, and these coincide satisfactorily with the after-images. The periodic after-images are ascribed to the rhythmic activity of the cortical visual center. T. V. Moore (Psychol. Abstr.).

Action of Atropine on the Electroencephalogram. Markosyan, A. A. [*Byull. Eksptl. Biol. Med.*, **13**, *No.* 3/4, 69–71 (1942).]

Intravenous injection of atropine leads to complete disappearance of waves of excitability of brain cortex. Hence it may be supposed that these waves are conditioned by changes of acetylcholine metabolism. G. M. Kosolapoff (Chem. Abstr.).

The Action of CO_2 in Epilepsy and Schizophrenia on the Basis of Electric Findings on the Brain. Kornmüller, A. E. [*Münch. med. Wochschr.*, **1**, 30 (1942); *Klin. Wochschr.*, **21**, 678 (1942).]

In certain cases of schizophrenia and epilepsy in which the cerebral bioelectrical findings (especially in the frontal region) reveal abnormally slow waves, a decrease in these variations could be produced by inhalation of a mixture of 5 per cent. CO_2 and 95 per cent. O. This effect of CO_2 is explained by its action on the cerebral circulation (in CO_2 excess the circulation would be increased, while in CO_2 deficiency, e.g. through hyperventilation, it would be decreased), as well as by the fact that CO_2 is an adequate stimulus for certain brain sections (especially vegetative). Finally, the role of CO_2 in respiration, especially tissue respiration, is considered. With respect to the quite prompt normalization of the bioelectrical findings produced by the CO_2, it is proposed to carry out therapeutic experiments with the administration of CO_2 in epilepsy, schizophrenia and other brain diseases. The possibility is discussed that the therapeutic success of metrazole and insulin treatment as well as of electric shock depends at least in part on the accumulation of CO_2, which appears in the brain and blood; it would also be conceivable that the success of the work and exercise therapy in various brain diseases depends in part on the same basis. Ruth Berggren (Chem. Abstr.).

The Mechanism of Decurarization. Coppée, G. [*Bull. classe sci. acad. roy. Belg.*, **27**, 452–67 (1941); *Chem. Zentr.*, **11**, 245 (1943).]

The effects of various procedures in the blocking of motor nerve-ends caused by substances similar to curare were examined in the isolated nerve-muscle preparations of *Rana temporaria* and *R. esculenta*. The following preparations were used: (1) Quaternary ammonium bases (tetramethyl-tetraethyl- and phenyltrimethylammonium salts, choline, acetylcholine, doryl, medoryl and mecholyl); (2) pyrimidine derivatives (piperidine, conine, arecoline, F933, sparteine, etc.); (3) tropine derivatives (atropine, hyoscyamine, duboisine, scopolamine, cocaine); (4) strychnine and brucine; (5) substances with undetermined structure (cobra venom, curare); (6) surplus of Ca ions in isotonic solution. The nerve blocking can be eliminated by (*a*) partial washing with a less concentrated solution of the curarizing substance; (*b*) summation of the stimuli affecting the motor nerve ends; (*c*) veratrine; and (*d*) in case of blocking with curare, by the use of eserine. Hilda H. Wheeler (Chem. Abstr.).

Consumption of O by the Cerebrum in Toxic Shock. Charnyi, A. M., and Syrkina, P. E. [*Byull. Eksptl. Biol. Med.*, **13**, *No.* 5/6, 13–16 (1942).]

In healthy dogs the O absorption in the brain is lower than in the muscle tissues. In early period of shock (histamine, peptone, insulin or metrazole) the brain O consumption rapidly rises, with increased formation of CO_2. G. M. Kosolapoff (Chem. Abstr.).

Carbohydrate Metabolism of the Brain at the Early Shock Stage. Charnyi, A. M., Syrkina, P. E., and Krasovitskaya, S. E. [*Byull. Eksptl. Biol. Med.*, **13**, *No.* 5/6, 17–21 (1942).]

In normal dogs glycogen and sugar are retained by brain tissue and utilized by it. Metrazole shock does not essentially change this activity. Both insulin and metrazole shocks are associated with definite decrease of glycogen content in the brain; apparently this is due to increased utilization rate of the stored carbohydrates. G. M. Kosolapoff (Chem. Abstr.).

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Intracranial Tumors in Rats after 3,4-Benzopyrene. *Baglioni, Tommaso.* [*Tumori*, **16**, 402–22; (1942); *Chem. Zentr.*, **1**, 2406 (1943).]

If a solution of benzopyrene in petrolatum is introduced into the cranial cavity of rats, intracranial tumors develop in a few of the animals. However, many animals are lost with this treatment. R. BEUTNER (Chem. Abstr.).

K and Ca Content of Muscle and Nerve in the Different Stages of Neuromuscular Transmission. *Lissák, K., and Kovács, T.* [*Arch. ges. Physiol.* (*Pflügers*), **245**, 790–3 (1942); *Chem. Zentr.*, **11**, 336 (1943).]

In previous work the acetylcholine content and cholinesterase activity of the gastrocnemius muscle and sciatic nerve in stages 4 and 5 of neuromuscular transmission were determined. Under similar conditions the Ca and K contents of muscles and nerves were determined. It was found that there were no significant differences between the Ca and K contents of the stimulated and resting sides. By indirect stimulation the K content of the muscles was reduced, while the Ca was almost always increased. In stage 5 the K content of the muscles increased to the starting level, exceeding it in most cases. Besides the acetylcholine-cholinesterase system, K also plays an important role in the fatigue of the synapse and regeneration following prolonged stimulation. A. EDELMANN (Chem. Abstr.).

Vitamin B Factors in Toxic Psychosis of Pregnancy and the Puerperium. *Hart, B. F., and McConnell, W. T.* [*Am. J. Obstet. Gynecol.*, **46**, 304 (1943).]

Two patients who developed psychosis after toxic disturbances in pregnancy responded to therapy with vitamin B components. The niacin was probably the most important factor. This indicates that psychosis in pregnancy and the puerperium may in some cases be associated with disturbances in the vitamin B metabolism. RUTH BERGGREN (Chem. Abstr.).

Colorimetric Determination of Nicotinic Acid. *Teeri, Arthur E., and Shimer, Stanley R.* [*J. Biol. Chem.*, **153**, 307–11 (1944).]

The use of m-phenylenediamine as the chromogenic amine in the colorimetric determination of nicotinic acid has been found highly satisfactory if its addition to the nicotinic acid-cyanogen bromide solution is followed immediately by acidification with 20 per cent. HCl. Colour development is immediate, and the stability and intensity are both greater than is the case with most other amines. Colour or turbidity in extracts is accounted for by use of two blanks, the effects of which are additive. A. E. TEERI (Chem. Abstr.).

Serological Studies of the Nucleoproteins of the Central Nervous System. *Valenta, Andras.* [*Debreceni Tisza István Tudományos Társaság II, Osztályának Munkai*, 480–3 (1942); *Chem. Zentr.*, **1**, 747 (1943).]

Nucleoproteins (I) from different parts of the central nervous system of man and cattle were prepared. Serological tests identified the different sources of (I). The proteins are not species-specific, but are organ-specific. W. J. PETERSON (Chem. Abstr.).

Nerve Conduction as an Effect of Mutual Influence. *Schmidt, Otto.* [*Naturwissenschaften*, **80**, 644–5 (1942); *Chem. Zentr.*, **1**, 1076 (1943).]

Mutual influence exists between valence electrons which are in agreement with simple linkage and those which are not. This leads to regularities in chemical behavior governing many reactions. In the unsaturated molecule an unbound valence electron (present in the radical, formed by stimulation from a multiple bond) represents a place of disturbance. The simple bond next to this disturbance is reinforced, the one following is weakened. This alternation continues through the molecule with decreasing intensity. An interpretation of nerve conduction is given, based on this theoretical reasoning, explaining why a stimulus runs always in one direction only and why no two stimuli may travel in opposite directions simultaneously. In the polypeptides of the nerve fiber CO-CHR-NR groups follow periodically; this causes the formation of periodically distributed disturbances in the chain able to transmit a stimulus through the whole chain. No places of disturbance exist in the protein chain in the original state, since the double linkages of C : O groups are not stimulated. If a ketonic group is transformed into an enolic group, the C : O group next to the new C : N or C : C linkage is in γ-position. The stimulation may jump over to this one and thus follow the whole chain. The direction from the first disturbance depends on whether the enol formation is effected from the first C : O group by migration of the methine H or the amine H.

A. E. MEYER (Chem. Abstr.).

Role of Aneurine in the Cholinergic Neuro-effector Systems. *Lissák, Kálmán.* [*Debreceni Tisza István Tudományos Társaság II, Osztályának Munkai*, 113–34 (1942); *Chem. Zentr.*, **1**, 856–7 (1943).]

The sensitivity to acetylcholine of the isolated heart of the guinea-pig, rat and frog was not increased by aneurine nor was that of hearts of animals deficient in vitamin B_1 or treated with vitamin B_1. The acetylcholine content of heart, transversely striated and small intestine musculature of B_1-avitaminotic animals was near normal, that of the central nervous system decreased and that of the sciatic nerve unchanged. The cholin-esterase content of the organs

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studied was decreased. The neuromuscular transmission of impulses and the appearance of fatigue and excitability of the muscles of animals deficient in vitamin B_1 remained unaltered.
MAURICE M. RATH (Chem. Abstr.).

Myasthenia Gravis: A Consideration of its Causation in Fourteen Cases. Wilson, Andrew, and Stoner, H. Berrington. [*Quart. J. Med.*, **13**, 1–18 (1944).]
Patients with myasthenia gravis are able to synthesize acetylcholine in sufficient amounts to produce the normal "muscarine" effects on glands and involuntary muscle. These effects are increased by administration of pilocarpine. The serum of patients not under prostigmine treatment, when tested on the isolated nerve-muscle preparations of the frog, produced a block in neuromuscular transmission caused by a substance partially soluble in alcohol. The serum cholinesterase activity of patients with myasthenia gravis was not increased; hence the muscular weakness is not due to rapid destruction of acetylcholine.
JOHN T. MYERS (Chem. Abstr.).

The Production of Antibrain Antibodies in the Monkey. Koeploff, Lenore M., and Kopeloff, Nicholas. [*J. Immunol.*, **48**, 297–304 (1944).]
Homologous brain antibodies were produced in the rhesus monkey.
C. A. ZITTLE (Chem. Abstr.).

Sudden Destruction of Motor End Plates by Lactic Acid. Carey, Eben J., and Massopust, Leo. [*Proc. Soc. Exptl. Biol. Med.*, **55**, 194–7 (1944).]
Lactic acid in concentrations of 0·05–0·3 per cent. injected into the exposed zone of innervation of the sternomastoid muscle in white rats produced destruction of the motor nerve end plates in 0·5–30 minutes, depending on the concentration of the acid. Histological details are given.
L. E. GILSON (Chem. Abstr.).

Experimental Brain Tumors. III: Tumors Produced with Dibenzanthracene. Arnold, Hildegarde, and Zimmerman, H. M. [*Cancer Research*, **3**, 682–5 (1943); *cf. C.A.*, **38**, 1081⁹.]
Tumors were produced in 13 of 21 female C_3H mice after implantation of pellets of dibenzanthracene in the right cerebral hemisphere. The tumors included 2 gliomas, 2 meningeal sarcomas, 8 extracranial fibrosarcomas and a squamous cell carcinoma of the scalp.

IV: The Incidence in Different Strains of Mice. Zimmerman, H. M., and Arnold, Hildegarde. [*Ibid.*, **4**, 98–101 (1944).]
The incidence of methylcholanthrene-induced tumors was not related to the tendencies of different mouse strains to develop spontaneous mammary tumors.
E. R. MAIN (Chem. Abstr.).

An Apparatus for Grinding Small Samples of Brain Tissue. Terrill, H. M., and McKinstry, D. W. [*J. Franklin Inst.*, **237**, 315–16 (1944).]
The apparatus consists of a stainless steel pestle fitting a pyrex test-tube. The head (diagram given) has shallow, rounded grooves cut spirally in such direction that the ground material is forced downward in the pyrex tube fitting the pestle. The pestle is used in the chuck of a small drill press, the drill press being ideal for the grinding, since it provides sufficient power for thorough grinding at low speeds, thereby avoiding local heating. The pyrex test-tube (chilled with its contents and pestle beforehand, if desired) is held by hand and occasionally raised and lowered to ensure grinding of all the brain tissue, to which a little sterile distilled H_2O is usually added before starting. The instrument has proved safe and sufficient for homogenizing small quantities of brain tissue.
EDWARD B. SANIGAR (Chem. Abstr.).

Phosphatase Activity in Chromatolytic Nerve Cells. Bodian, David, and Mellors, Robert C. [*Proc. Soc. Exptl. Biol. Med.*, **55**, 243–5 (1944).]
Markedly increased acid phosphatase activity was found, by histochemical methods, in regions of the cytoplasm of nerve cells in which chromatolysis had been produced by axone section. The increase in activity was proportional to the degree of chromatolysis, and is thus probably associated with increased nucleoprotein synthesis or degradation.
L. E. GILSON (Chem. Abstr.).

Oxidation of Fructose by Brain in vitro. Klein, J. Raymond. [*J. Biol. Chem.*, **153**, 295–300 (1944).]
In the aerobic oxidation of fructose by cat brain in vitro, O_2 and inorganic phosphate disappeared. Resistance to acid hydrolysis of the major fraction of the organic phosphate suggested that phosphoglycerate had been formed. Lactate was formed in some, but not all of the experiments. Direct oxidation of triose phosphate is suggested as a step in the formation of lactate. Previous attempts to demonstrate lactate formation from fructose in brain probably did not succeed owing to the use of concentrated preparations. The reactions that account in part for the oxidation of glucose and fructose are the same.
HOWARD C. HOPPS (Chem. Abstr.).

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The K and Ca Contents of Muscles and Nerves in the Various Stages of Neuromuscular Transmission of Stimulation. Kovács, Tibor. [*Debreceni Tisza István Tudományos Társaság II. Osztálydnak Munkai*, 414–19 (1942); *Chem. Zentr.*, **1**, 858–9 (1943).]

Supermaximal stimulation of an ischiadic nerve for 30 minutes causes no change in the Ca and K contents in cats and rabbits as compared with the non-stimulated nerve. After indirect stimulation of the gastrocnemius the K content is lowered and the Ca increased. After restitution of the contractibility of the muscle the K content increases beyond the initial value. Next to the cholinesterase, the K content has a fundamental influence on fatigue and recovery in muscular stimulation. A. E. MEYER (Ch m. Abstr.).

Neuromuscular and Ganglionar Transmission of Excitation. Lissák, Kálman. [*Debreceni Tisza István Tudományos Társaság II, Osztálydnak Munkai*, 135–52 (1942); *Chem. Abstr.*, 1, 859 (1943).]

After intra-arterial injections of acetylcholine (I) supplying the muscle or after injection into the ganglion the depressor effect in the second stage is prolonged; in the first and third stages the nerve endings are paralyzed, in the fourth a delay of fatigue is observed. In this latter stage the content of (I) is described in the nerve and increased in the muscle, while the cholinesterase activity (II) is reduced. In the fifth stage the (I) content of the muscle is decreased, the (II) enhanced. The K plays an important role also. Experiments on transmission of excitation in Waller's degeneration of the ischiadic nerve in the cat showed that during completely abolished neuromuscular transmission the current of nerve action retains almost its normal strength. The intensity of the currents of impulse remains unchanged even after prolonged stimulation. After prostigmine the muscles react to indirect single stimulation with rhythmic, to direct stimulation with single, contractions. A. E. MEYER (Chem. Abstr.).

Brain Metabolism and Mental Deficiency. Himwich, Harold E., and Fazekas, Joseph F. [*Am. J. Mental Deficiency*, **48**, 137–41 (1943); *cf. C.A.*, **86**, 3855[5].]

The difference in O_2 content of arterial blood entering and venous blood leaving the brain (A–V difference) was detected in 101 mentally deficient patients over 20 years old and in 123 under 20 years. In adult undifferentiated mental defectives with no anatomical, physiological or biochemical stigmata the A–V difference was normal, but in adult mongoloids, cretins and phenylpyruvic oligophrenics it was significantly below normal. In children with undifferentiated mongoloid mental deficiency the A–V difference was considerably below the normal adult level. With increasing age the A–V difference increased to the normal adult level in the undifferentiated defectives, but the increase was arrested before it reached the normal in mongoloids.
WARREN M. SPERRY (Chem. Abstr.).

The Inheritance of Certain Varieties of Mental Defect. Allen, W., and Halperin, S. L. [*N. C. Med. J.*, **3**, 363 (1942).]

This article summarizes some special studies, including a few by the authors, which attempt to break down the "conglomerate mass of conditions, known to-day as mental deficiency, into component clinical entities with definite pathology in which process genetics may play an important role." Mongolism is significantly familial with an as yet unknown genetic factor and is not a result of defective thyroid functioning. Phenylketonuria and gargoylism are both conditions in which it has been found that mental deficiency is associated with abnormalities of bodily metabolism. It has been verified that the former is a result of the action of a single recessive gene, as is Tay-Sachs disease or amaurotic idiocy. Statistical studies suggest that gargoylism is likewise due to the action of a pathological gene, recessively inherited.
R. W. BEEBE (Psychol. Abstr.).

Thiamine Inactivation by the Chastek-paralysis Factor. Inhibition of Thiamine Inactivation. Sealock, Robert R., and Goodland Ruth L. [*J. Am. Chem. Soc.*, **66**, 507–10 (1944).]

The destruction of thiamine (I) by the Chastek-paralysis factor of fish tissues (*cf. C.A.*, **37**, 4112[3]) is markedly decreased by the addition of Cu++, Zn and Fe+++; the percentage inhibition (concentration 1×10^{-3} mol./1, unless otherwise given) is: $CuSO_4$ 50, $ZnCl_2$ 41·3 $FeCl_3$ 45·6, KCN 23·8, NaF 13·1, ICH_2CO_2H 4·3, cysteine (0·1) 56·7, (0·01) 9·9, Na_2SO_3 (0·01) 9·5. Other common enzyme inhibitors could not be tested because they interfered with the determination of (I) by the diazotization method. Compounds resembling the (I) molecule in one or more features were also tested for inhibitory action. Among these, o-aminobenzyl-(II) and β-aminoethyl-4-methylthiazolium chloride were found to be strongly inhibitory. Substitution of the NH_2 group of these compounds by the NO_2 and phthalimido-groups respectively abolished the inhibition in the former and greatly reduced it in the latter. Other thiazoles and various 4-aminopyrimidines were either without effect or exhibited considerably lessened inhibition. With (II), the extent of the inhibition proved to be dependent upon the ratio of its concentration to that of (I). Use of the Lineweaver-Burk method (*C.A.*, **28**, 3092[1]) showed that (II) specifically inhibited (I) destruction by competing with the vitamin for the fish principle. The same method yielded a Michaelis constant of $0{\cdot}831 \times 10^{-4}$ mol./1 for (I) and $0{\cdot}0197 \times 10^{-4}$ for (II). The data presented show that the fish principle behaves with inhibitors as do many enzymes; this may be interpreted as additional evidence of the enzyme nature of the fish principle.
C. J. WEST (Chem. Abstr.).

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The Cerebral Circulation in Altitude Collapse. Schneider, M. [*Luftfahrtmed.*, **6**, 323 (1942); *Klin. Wochschr.*, **21**, 1088 (1942).]

The cerebral circulation in O deficiency was studied by measuring the arterial inflow, the venous outflow and the arteriovenous O difference of the cerebral blood; pressure changes in the cerebrospinal fluid were registered. The cerebral circulation increased in O deficiency, partly by increase in blood pressure, partly by dilatation of the cerebral vessels, which, however, did not begin until an equilibrium had been established toward the hypoxemia for 3–6 minutes. With increasing hypoxemia the dilatation of the vessels increased progressively according to the hyperbolic course of a concentration-activity curve, until at 4–5 per cent. O content of the inspired air the maximum of cerebral circulation generally possible was attained. The registration of the pressure of the cerebrospinal fluid showed changes corresponding to the increase in circulation, so that in precollapse pressure values up to 450 cm. water were obtained experimentally. For the complete suppression of the circulation of the cerebrum it was established that the reassumption of the function here could still be attained after 5 minutes, in the basal ganglia after 10–15 minutes and in the medulla oblongata after 20 minutes. In respiration of the O-poor air mixture the utilization first decreased corresponding to the increase in circulation; the O uptake of the encephalon was not measurably diminished. Upon lowering of the O tension in the venous blood of the brain a measurable decrease in the O uptake of the brain suddenly occurred conforming to a collapse which rapidly appeared. In the treatment of altitude collapse, in addition to giving O every means should be taken to raise the lowered arterial pressure. RUTH BERGGREN (Chem. Abstr.).

Effect of Mental Activity on Metabolism. Jongbloed, J. [*Nederland. Tijdschr. Geneeskunde*, **86**, 2012–17 (1942); *Chem. Zentr.*, **11**, 2050 (1942).]

Studies on four students showed that the metabolism as measured by CO_2 production rises about 4½ per cent. during reading a foreign language or during mental calculation.
MAURICE M. RATH (Chem. Abstr.).

Experimental Bases of the Serological Demonstration of the Brain Lipoid in the Blood. Roeder, Fritz. [*Klin. Wochschr.*, **21**, 1093–6 (1942).]

After the brain lipoids have entered the blood stream a fraction of the organ-specific brain antigen, which can be determined serologically, disappears from the serum but can be demonstrated in the whole blood, probably as a result of binding to the formed elements of the blood.
RUTH BERGGREN (Chem. Abstr.).

Changes of the Brain Tissue During CO Poisoning. Nakamura, Hirosi, and Takami, Tosikatu. [*Trans. Soc. Path. Japon.*, **29**, 456–61 (1939); *Chem. Zentr.*, **11**, 2172 (1942).]

CO poisoning inhibits the respiration of the brain of rabbits. This inhibition parallels morphological changes of the tissue. The permeability of the capillaries is increased, but can be reversed if the rabbits are made to breathe O. GERTRUDE E. PERLMANN (Chem. Abstr.).

Behavior of Vitamin C in a Series of Nervous and Metabolic Ailments. I: Estimation of Ascorbic Acid in Blood with 2, 6-dichlorophenolindophenol. Nielsen, Otto Jul, and Hjarde, W. [*Nord. Med.*, **10**, 1122–7 (1941).]

Sources of error in the determination are discussed.

II: Is Ascorbic Acid the Provitamin of Vitamin C? Hjarde, W., and Nielsen, Otto Jul. [*Ibid.*, 1127–8.]

Experiments show that ascorbic acid and vitamin C are identical. (Through *Chem. Zentr.*, **1**, 3532 (1941).) L. E. GILSON (Chem. Abstr.).

Effects of Different Intakes of B-complex Vitamins on Neuromuscular Regeneration. Hines, H. M., Lazere, B., and Thomson, J. D. [*Proc. Soc. Exptl. Biol. Med.*, **55**, 97–8 (1944); *cf. C.A.*, **37**, 1715.]

In rats neuromuscular regeneration was not appreciably effected by acute vitamin B-complex withdrawal, and was not enhanced by excessive intake of these vitamins. The neuromuscular weakness of regenerating and non-denervated muscles of rats on B-complex deficient diets was of the same order as that found in animals subjected to acute inanition or to food withdrawal while continuing B supplements. L. E. GILSON (Chem. Abstr.).

Neuromuscular Disorders in Rats after Adrenalectomy and Their Origin. Chauchard, Paul, Mazoué, H., and Chapolin, H. [*Compt. rend. soc. biol.*, **137**, 207–8 (1943).]

In young rats adrenalectomy is followed by increases in central and peripheral motor nerve chronaxia. Muscle chronaxia is not increased. The intraperitoneal injection of 1 mgm. of desoxycorticosterone acetate restores the nerve chronaxia to normal and may decrease it to below normal. These effects are very similar to those observed in avitaminosis C.
L. E. GILSON (Chem. Abstr.).

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Relation of the Hypothalamus to Respiratory Metabolism. Bloch, Walter. [*Helv. Physiol. Pharmacol. Acta*, **1**, 53–78 (1943) (*in German*).]

A respiratory chamber for cats is described. The normal cat at rest utilized 510–770 c.c. of O per kg. per hour. Removal of portions of the middle part of the hypothalamus caused a decrease in metabolic rate, with body temperature sometimes remaining below normal for days at a time. In some cats the effect was permanent; in others a return to normal occurred after several weeks. Susceptibility to infection of the nasal passages was increased.

L. E. GILSON (Chem. Abstr.).

Liberation of Thiamine by Stimulation of Peripheral Nerves. Liechti, A., Muralt, A. v., and Reinert, M. [*Helv. Physiol. Pharmacol. Acta*, **1**, 79–88 (1943) (*in German*); *cf. C.A.*, **35**, 2957.[6]]

An elaborate electrical apparatus for recording the pulse rate of rats is described. With its aid preparations can be assayed for thiamine by its slowing effect on the rat heart. It was shown that electric stimulation of the isolated sciatic nerve of *Rana esculenta* appreciably increases its content of free thiamine (or thiamine phosphate). Acetylcholine is formed at the same time, but in much smaller amounts. Thiamine appears to play an inportant part in the metabolism of peripheral nerves.

L. E. GILSON (Chem. Abstr.).

The Presence of Thiamine and Cocarboxylase in the Spinal Fluid. Abderhalden, Rudolf, and Elsaesser, Karl-Heinz. [*Arch. ges. Physiol.* (*Pflügers*), **247**, 24–33 (1943).]

Normal and pathological cerebrospinal fluids contain from 0·2 to 1·5 per cent. of thiamine and from 0 to 0·5 per cent. of cocarboxylase. No correlations are found between various pathological processes and the contents of these substances. After the intravenous or intramuscular injection of thiamine, the latter appears in the cerebrospinal fluid. After the injection of 50 mgm. of thiamine, the total thiamine content of the spinal fluid increases about 25 per cent. after 3 to 5 hours, but returns to its normal level within 24 to 26 hours. When thiamine is injected into the cisterna magna it rapidly disappears from the cerebrospinal fluid, and hence there is no advantage in introducing it in this manner clinically.

ARTHUR GROLLMAN (Chem. Abstr.).

Partition of Phosphorus in Mammalian Brains. Lahiry, N. L., Venkataraman, P. R., Anantakrishnan, C. P., and De, N. N. [*Indian J. Med. Research*, **30**, 619–22 (1942).]

Total P in brains of goat, dog, rat, ox and rabbit ranged from 305 to 360 mgm. per 100 gm. moist tissue. The distribution of acid-soluble, inorganic and ester fractions labile and resistant to hydrolysis was roughly similar in the five brains.

M. H. POWER (Chem. Abstr.).

A Parallelism Between the Quantitative Incidence of Carbonic Anhydrase and Functional Levels of the Central Nervous System. Ashby, Winifred, and Chan, Dorothea V. [*J. Biol. Chem.*, **152**, 235–40 (1944); *cf. C.A.*, **38**, 1252[9].]

In the steer, dog, cat, hog, guinea-pig, chicken and man, the content of carbonic anhydrase in the cerebral tissue is approximately twice that in the cord. The larger amount present in the cerebrum is not due to the larger proportion of grey matter present, but may be due to differences in the amount of enzyme contained in the neurons entering into the composition of the respiratory areas. If this be so, it is probable that the carbonic anhydrase content might bear a relationship to the factors which cause the functional dominance of the cerebrum over the cord.

A. E. TEERI (Chem. Abstr.).

Acetylation in Patients with Myasthenia Gravis. The Elimination of p-Aminobenzoic Acid. Torda, Clara, and Wolff, Harold G. [*Proc. Soc. Exptl. Biol. Med.*, **55**, 86–90 (1944).]

After large or small oral doses, both healthy subjects and patients with myasthenia gravis excreted p-aminobenzoic acid in essentially the same manner with respect to time of elimination and amounts of free and acetylated forms. It is inferred that there is no serious insufficiency of acetyl radical in such patients.

L. E. GILSON (Chem. Abstr.).

Similar Nervous Disturbances Due to CO Poisoning in Two Subjects of the Same Family. Silberschmidt, W. [*Schweiz. med. Wochschr.*, **71**, 441–2 (1941); *Chem. Zentr.*, **11**, 231 (1941).]

Two patients from the same family fell to the left when walking, showed unsteady gait and disturbances in the left leg and foot in CO poisoning established by blood analysis. No vomiting occurred.

MAURICE M. RATH (Chem. Abstr.).

Aspects of the Effects of Intravenous Injections of Acetylcholine on the Central Nervous System. Stavraky, Geo. W. [*Trans. Roy. Soc. Can.*, **37**, *Sect. V*, 127–39 (1943).]

A study of the effects of intravenous injections of acetylcholine in unanesthetized cats having one or both frontal lobes aseptically removed. The injection of 0·05–0·2 mgm. into cats with one lobe removed 5–6 weeks previously produces characteristic tonic muscular seizures and unilateral sympathetic stimulation on the opposite side of the body. Larger doses produce generalized convulsions. Bilateral removal of the frontal lobes produces an animal that shows

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all signs of sympathetic excitation when acetylcholine is injected. Semidecerebrate cats are very sensitive to acetylcholine, and may be distinguished from frontal-lobectomized animals.
C. J. CARR (Chem. Abstr.).

Acetylcholine Content of the Myenteric Plexus and Resistance to Anoxia. Welsh, John H., and Hyde, Jane E. [*Proc. Soc. Exptl. Biol. Med.*, **55**, 256–7 (1944).]

It is shown that the estimated acetylcholine content of the myenteric plexus of rabbits and guinea-pigs (0·4–0·8 mgm./gm.) is higher than that of any other mammalian nervous tissue. The cells of this plexus are the most resistant of all nerve cells to anoxia. Thus further evidence is provided that indicates a relationship between resistance to anoxia and acetylcholine content of different parts of the nervous system. L. E. GILSON (Chem. Abstr.).

Acetylcholine Content and Cholinesterase Activity of Muscles and Nerves in Different States of Neuromuscular Excitation Transfer. Nagy, E. Klara. [*Debreceni Tisza István Tudományos Társaság II, Osztályának Munkai*, 443–51 (1942); *Chem. Zentr.*, **1**, 747 (1943).]

The acetylcholine (I) content of a nerve (frog or cat) irritated to complete fatigue is appreciably lower than the un-irritated nerve. (I) is increased in the irritated muscle and the cholinesterase activity (II) is decreased. If irritation is continued further, the nerve function and contraction capacity of the muscle are restored after 2–3 hours. The content of (I) in the nerve and muscle is then greater than in the resting state, while (II) is lower. (I) plays an important role in irritation transfer and cannot be considered a by-product of nerve metabolism.
W. J. PETERSON (Chem. Abstr.).

The Amphomimetism of Acetylcholine. Research on the Nictitating Membrane of the Cat. Danielopolu, Daniel, and Marcu, Ion. [*Compt. rend.*, **215**, 427–8 (1942).]

Additional evidence is submitted to support the authors' claim of the amphomimetic nature of acetylcholine (I). In an adrenalectomized, anesthetized cat with its cervical sympathetics sectioned, 1 mgm. of (I) produces a hypertension and contraction of the nictitating membrane if preceded by 1 mgm. eserine and atropine. In an adrenalectomized, cervical sympathectomized, anesthetized cat treated with cocaine and atropine, adrenaline and (I) produce a greater hypertension and contraction of the nictitating membrane than adrenaline alone. In an adrenalectomized cat (I) produces a contraction of the nictitating membrane after atropine. This action is sensitized by cocainization. A summary of earlier work on this subject is included.
A. EDELMANN (Chem. Abstr.).

Acetylcholine Content and Cholinesterase Activity of Muscle and Nerve in Different Stages of Neuromuscular Transmission. Lissak, K., Nagy, E. K., and Pasztor, J. [*Arch. ges. Physiol. (Pflügers)*, **245**, 783–9 (1942); *Chem. Zentr.*, **11**, 335–6 (1943).]

Additional support for the chemical theory of transmission is furnished. Stimulation of muscles at a fixed frequency (400/second) by indirect current at regular intervals showed the following stages: (1) A prompt rise in potential; (2) subsidence of the same; (3) a new rise followed by a slow fall; (4) complete fatigue; (5) continued ascent of potential and recovery of contractibility. Acetylcholine (I) was determined in normal and stimulated motor nerves during stages 4 and 5. There was a continual decrease in (I) content from the start of excitation until the beginning of fatigue, but there was a subsequent rise, and at stage 5 it exceeded that of normal resting nerve. In the present work the relationship between (I) content and cholinesterase (II) activity in the phases of excitation was investigated. The (I) content and (II) activity of the gastrocnemius muscles and sciatic nerves of frogs and cats were determined at stages 4 and 5. After stimulation of the sciatic nerve with maximum condenser charge (at 60/second) the neuromuscular synapse went into full fatigue (stage 4). In this state the (I) content of the nerve was significantly lower than that of the unstimulated nerve from the opposite side. The (I) content of the correspondingly stimulated muscle was increased, the activity of (II) reduced. By continuing the stimulation in stage 4, the potential and contractibility were restored (stage 5) in 2 to 3 hours. In this phase the (I) content was equal to or somewhat higher than that of resting nerve. With prolonged stimulation, therefore, the relationships between (I) content and (II) activity are reversed. In stimulated muscle the (I) content is less, the (II) activity higher than in resting muscle of the opposite side. Control experiments show that the (I) content and the (II) activity of resting muscles and nerves from both sides of the animal are similar. There exists a relationship between the (I)–(II) system and the stage of neuromuscular excitation. (I) occupies an important place in the transmission of impulses, and in no case can it be regarded as a by-product of nervous metabolism. A. EDELMANN (Chem. Abstr.).

Acetylcholine Content in Dog Blood in the Hunger Activity of the Gastro-intestinal Tract. Prokopenko, V. G. [*Byull. Eksptl. Biol. Med.*, **13**, *No.* 3/4, 91–2 (1942).]

Both during digestive and hunger activity, there appear in dog blood substances which are capable of causing contraction of the dorsal muscle of the leech, which is the classical test for acetylcholine. G. M. KOSOLAPOFF (Chem. Abstr.).

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Epileptoid and Shock Phases of the Syncope Syndrome and the Possible Role of Acetylcholine in their Genesis. *Barnard, Robert D.* [*Ohio State Med. J.*, **39**, 907–12 (1943).]

The syncope syndrome in both its splanchnic and somatic manifestations can be explained on the basis of acetylcholine intoxication. A hypothesis relating psychogenic syncope to the excessive systematic liberation of acetylcholine is presented.

RUTH BERGGREN (Chem. Abstr.).

Potentiation of the Action of Acetylcholine with Donaxine. *Mashkovskii, M. D.* [*Byull. Eksptl. Biol. Med.*, **18**, *No.* 3/4, 87–90 (1942).]

Donaxine action cannot be considered to be similar to that of eserine, as shown by experiments *in vivo*. Donaxine does not inactivate cholinesterase; hence it should not be classed with eserine-type substances.

G. M. KOSOLAPOFF (Chem. Abstr.).

The Distribution of Cholinesterase in the Bovine Retina. *Anfinsen, Christian B.* [*J. Biol. Chem.*, **152**, 267–78 (1944).]

The histological structure of the retina permits the isolation and study of cytologically homogeneous sections of this issue. Thus the retina is useful as a test organ for the study of the general physiology of otherwise inaccessible components of the central nervous system. By use of single horizontal sections of bovine retina both for quantitative histological analysis and for chemical study, it was determined that the enzyme cholinesterase has a predominantly synaptic localization. This provides direct support for the theory of chemical mediation of the nervous impulse.

A. E. TEERI (Chem. Abstr.).

The Cholinesterase of the Blood Serum. *Werle, E., and Stuttgen, G.* [*Klin. Wochschr.*, **21**, 821–2 (1942).]

Pure callicrein preparations added to serum *in vitro* did not change the cholinesterase activity. Impure preparations contain a low-molecule, highly stable substance which activates the enzyme. Intravenous injection of callicrein in human beings had no effect on the esterase activity of the serum. Histamine can inhibit the cholinesterase in human serum to a very marked degree. The cholinesterase in the serum was inhibited by tetanus toxin, but such large doses were required that a specific action cannot be assumed. The esterase in 0·05 c.c. human serum was not affected by 3,300 toxin units; 13,000 units effected a 70 per cent. inhibition. The cholinesterase values in chronic constipation were distinctly above the normal. The blood cholinesterase was lowered in a 4-year-old boy born without thyroid glands.

RUTH BERGGREN (Chem. Abstr.).

Inhibition of Cholinesterase Activity of Nervous Tissue by Eserine in vivo. *Cantoni, G. L., and Loewi, O.* [*J. Pharmacol.*, **81**, 67–71 (1944).]

The acetylcholine present in the central nervous system and peripheral nerves of the frog (*Rana pipiens*) is completely or almost completely hydrolyzed during grinding and subsequent incubation of the tissues. Subcutaneous injection of eserine, even in large doses, does not affect this process in the case of the central nervous system, but almost completely protects the acetylcholine of the peripheral nerves. The eserine does not inhibit propagation of impulses in the peripheral nerves.

L. E. GILSON (Chem. Abstr.).

Changes of Cholinesterase Activity in the Nerve Fibers on the Poles of Direct Current. *Minaev, P. F.* [*Byull. Eksptl. Biol. Med.*, **18**, *No.* 3/4, 77–8 (1942).]

Application to nerve fibers of the anode of d.-c. circuit causes an enhancement of cholinesterase activity; the cathode causes a decrease in the activity.

G. M. KOSOLAPOFF (Chem. Abstr.).

Plasma Cholinesterase in Male and Female Rats. *Mundell, Dorothy B.* [*Nature*, **153**, 557–8 (1944).]

The greater activity of the plasma of mature female rats towards acetylcholine, as compared with that of mature males and immature females, is due mainly to the activity of the pseudocholinesterase.

E. D. WALTER (Chem. Abstr.).

Determination of Protein in Cerebrospinal Fluid. *Abelin, I.* [*Schweiz. med. Wochschr.*, **78**, 332–4 (1943).]

Trichloroacetic acid is added to 4 to 6 c.c. of cerebrospinal fluid, the washed precipitate separated centrifugally and the N content estimated by the micro-Kjeldahl method. Albumin N is estimated as the difference between the values for total N and globulin N, the latter being determined in the precipitate formed in strong Na_2SO_4 solution at 38°. The new method was compared with Kufka's method, in which the protein content is determined after precipitation with picric acid and was found to be more reliable and sensitive.

MAURICE M. RATH (Chem. Abstr.).

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Vitamin C Content of the Cerebrospinal Fluid in Nervous and Mental Diseases. Hordnyi, B., and Láng, S. [*Wiener med. Wochschr.*, **93**, 464–5 (1942).]

The cerebrospinal fluid of the cases studied contained 0·5–2·0 mgm. per cent. of ascorbic acid. The content varied with the age of the patient, the diet and the season of the year, but there was no definite correlation between it and the severity of the nervous disorder.

L. E. GILSON (Chem. Abstr.).

Relation between the Ascorbic Acid Content of Serum and Cerebrospinal Fluid. Westerguard, Frode. [*Nord. Med.*, **16**, 3536–8 (1942); *Chem. Zentr.*, **1**, 971 (1943).]

A linear relation was found between the content of reduced ascorbic acid of the serum and that of the cerebrospinal fluid, wherein the concentration in the latter was four times as great as in the former. In two persons with low ascorbic acid values in the cerebrospinal fluid (<0·4 mgm. per cent.) the attacks of vertigo were stopped by treatment with vitamin C.

MAURICE M. RATH (Chem. Abstr.).

The System Ca-protein in Serum and Spinal Fluid. Lockhart, Carlos E. [*Rev. facultad cienc. quim. (Univ. nacl. La Plata)*, **17**, 265–77 (1942).]

The content of Ca in the spinal fluid is higher than the content of ionized Ca in the serum. The differences are larger than can be attributed to the presence of protein in the spinal fluid.

A. E. MEYER (Chem. Abstr.).

Thiocyanate Compounds in Dog Saliva and Cerebrospinal Fluid. Gubenko, V. K. [*Byull. Eksptl. Biol. Med.*, **18**, *No.* 3/4, 102–3 (1942).]

Up to 3 mgm. per cent. of CNS compounds are found in dog saliva from the submaxillary glands; the gland excretion of CNS compounds weakens (or exhausts itself) rapidly. Artificial feeding of KCNS increases the content of CNS compounds in saliva. In the cerebrospinal fluid up to 2 mgm. per cent. of CNS compounds are found; these are not increased by feeding KCNS.

G. M. KOSOLAPOFF (Chem. Abstr.).

Nicotinic Acid in the Cerebrospinal Fluid in Infancy. Verrotti, Irene. [*Pediatria*, **51**, 1–9 (1943); *Chem. Zentr.*, **1**, 2312 (1943).]

In normal children nicotinic acid content of the cerebrospinal fluid is 15–35 γ per cent., average 23·9 γ per cent. In tetanus, meningitis and two cases of diencephalohypophyseal syndrome the content was decidedly higher.

R. P. E. HOPF (Chem. Abstr.).

2. Pharmacology and Treatment.

Bromide Intoxication. Kay, Frank A., Smith, Donald, and Johnson, Georgia. [*J. Med. Assoc. State Alabama*, **13**, 284–8 (1944).]

The ease and rapidity with which bromide becomes concentrated in the blood serum is demonstrated. The effectiveness of NaCl in hastening the elimination of bromide from the blood and tissues is shown graphically. The signs and symptoms of bromide intoxication are given.

RUTH BERGGREN (Chem. Abstr.).

Influence of Some Narcotics on Activity of Blood Cholinesterase. Heim, Fritz, and Rohde, W. [*Arch. exptl. Path. Pharmakol.*, **202**, 216–18 (1943).]

The activity of serum cholinesterase *in vitro* was inhibited 40 per cent. by addition of 0·05 per cent. of chloral hydrate to the serum, 25 per cent. by 0·1 per cent. of barbital, 20 per cent. by 0·1 per cent. of evipan-Na and slightly by 0·125 per cent. of phenobarbital-Na, $CHCl_3$, EtOH or tribromoethanol.

L. E. GILSON (Chem. Abstr.).

Hypnotics and Their Action on the Thalamic Centers. IV: The Action of $MgSO_4$ on the Pancreas. La Barre, Jean, and Vesselovsky, Olga. [*Arch. intern. pharmaco-dynamine*, **67**, 267–75 (1942); *cf. C.A.*, **36**, 2917⁷.]

The intravenous injection of $MgSO_4$ causes a diminution of the response of the pancreas in dogs, and the lipase content of the collected juice is low. In vagotomized dogs the inhibition does not take place after section of the medulla.

V: Effect of Na Barbital on Blood-sugar Regulation. [*Ibid.*, 334–42.]

The intravenous injection of Na barbital into normal dogs causes a fleeting rise of the blood-sugar level, and in dogs anesthetized with chloralose the effect is similar but much less. Transfusion of blood from the pancreatic vein of a dog under chloralose into the jugular vein of a depancreatized dog causes a 30 per cent. fall in the blood-sugar level of the latter. If the donor dog is under chloralose and barbital (250 mgm./kg.) the fall is only 9 per cent. Thus the barbital reduces the secretion of insulin.

M. L. C. BERNHEIM (Chem. Abstr.).

Effects of Narcotics and Benzedrine on Metabolic Processes in the Central Nervous System. Quastel, J. H. [*Trans. Faraday Soc.*, **39**, 348–59 (1943).]

The action of a drug in interfering with the respiratory activity of the nervous system is to

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disturb functional activity, the disturbance being proportional to the degree to which the respiratory activity is affected. Narcotics at low concentrations have the power of inhibiting the respiration of brain tissue *in vitro*. By use of the brain slice technique with brain cortex, definite inhibitions of respiration take place in the presence of narcotics at concentrations which produce narcosis in animals. These effects are not irreversible with narcotics such as the barbiturates or chloretone, or hyoscine. The steady state of the diminished respiration of brain slices brought about by small concentrations of narcotics is found to be greatly dependent on the concentration of K^+ in the medium. If a narcotic enters into a mass action equilibrium with an enzyme with which the substrate oxidized by the brain is also combined, an increase in substrate concentration does not lead to a diminution in the inhibitive power of the narcotic. Narcotics at low concentrations do not affect the known dehydrogenases. The addition of benzedrine at low concentrations to brain cortex respiring in a glucose medium neither increases nor decreases the respiration, nor will it neutralize the diminution of respiration due to the presence of a narcotic. VICTOR R. DEITZ (Chem. Abstr.).

The Effect of Narcotics on the Excretion of Free and Combined Ascorbic Acid. Ghosh, Baidya Nath. [*Ann. Biochem. Exptl. Med.*, **2**, 221–8 (1942).]

Administration of chloretone, paraldehyde, phenobarbital, amidopyrine and bromobenzene caused increased elimination of free ascorbic acid in the urine of rats. The excretion of combined ascorbic acid was markedly reduced, especially in cases where chloretone, amidopyrine and bromobenzene were fed. Administration of paraldehyde, amidopyrine and bromobenzene and, to a certain extent, of chloretone influenced similarly the elimination of free ascorbic in the urine of guinea-pigs. Urethan caused increased excretion of both free and combined ascorbic acid. Phenobarbital caused decreased elimination of both free and combined ascorbic acid in the urine. A general depletion of tissue ascorbic acid was observed in guinea-pigs, even when they were able to excrete increased amounts of free ascorbic acid. Rats showed increases both in concentration of tissue ascorbic acid and of urinary free ascorbic acid.

BENJAMIN PRESCOTT (Chem. Abstr.).

An Injectable Barbituric Acid Narcotic. Marri, Rodolfo. [*Arch. famacol. sper.*, **70**, 199–21 (1940); *Chem. Zentr.*, **11**, 2584 (1941).]

The action of "Narkogen" (formula not given) is described.

L. E. GILSON (Chem. Abstr.).

The Action of Some Barbiturate Derivatives (Barbital, Evipal, Narcogene, Eunarcon, Rectidon) on Smooth Muscle in vitro. Marri, Rodolfo. [*Sperimentale*, **94**, 620–5 (1940); *Chem. Zentr.*, **11**, 3093 (1941).]

Surviving muscles of intestine and bladder of the rabbit are inhibited in movement and tonus by the barbiturates. Applied in advance they prevent the increased tonus produced by acetylcholine and $BaCl_2$. The effect of barbital is less pronounced than that of the other compounds. If applied following acetylcholine or $BaCl_2$ they abolish the increased tonus and lead to hypotonicity. The effects of the barbiturates are reversible. A. E. MEYER (Chem. Abstr.).

Barbital Poisoning Treated with Amphetamine (Mecodrin) and Warm Baths. Frandsen, Sv. [*Ugeskrift Laeger*, **106**, 33–5 (1944).]

A case of poisoning with 5 gm. of barbital leading to unconsciousness of four days' duration was treated with large doses of amphetamine (mecodrin). Hyperemia, which occurred as a consequence of the amphetamine treatment, was treated with warm baths (26° for 10 to 20 minutes). Frandsen discusses the use of sulfonamides in preventing pneumonia in such poisonings. Ten gm. of sulfathiazole, given in one case, produced a long-lasting polyneuritis.

GERTRUDE E. PERLMANN (Chem. Abstr.).

Decolorizing Test Solutions for the Determination of Nicotinic Acid and Nicotinamide. Taufel, K., and Dahle, F. [*Z. Untersuch. Lebensm*, **85**, 414–23 (1943).]

Decolorization procedures in the determination of nicotinic acid (I) by the CNBr and $PhNH_2$ colorimetric method were investigated. Tests were made on uncolored solutions and solutions colored with caramel. Various common bleaching carbons adsorbed 38·2–90·2 per cent. of (I) amide with the coloring matter, depending on the C sample and amount used; 20–100 mgm. per 20 c.c. of solution was used. A wide range of adsorption was also obtained with common bleaching earths, (I) amide being more highly adsorbed than (I). However, a method for determination of total (I) and (I) amide by adsorption on Clarite standard A and elution with $Ba(OH)_2$ yielded good results, and this method is presented in detail. Precipitating $Zn(OH)_2$ in the test solution removed 10·9–17·7 per cent. of the (I) with the color. The production of $BaSO_4$ precipitate in the solution was too low in decolorizing power to be practical. The Ritsert decolorizing method (*C.A.*, **33**, 8659[3]), by which the (I) extract is dried and extracted with C_6H_6 : iso-PrOH or C_6H_6 : $CHCl_3$ mixtures yielded very satisfactory results.

M. M. PISKUR (Chem. Abstr.).

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Interrelation of Methionine, Choline, Betaine and Arsenocholine in the Chick. Almquist, H. J., and Grau, C. R. [*J. Nutrition*, **27**, 263–9 (1944).]
The effects of betaine or methionine and arsenocholine are additive, and together, are practically a complete substitute for choline. G. P. (Chem. Abstr.).

Inhibition of Cholinesterase by Novocaine and Larocaine. Ammon, R. [*Klin. Wochschr.*, **20**, 696–7 (1941); *Chem. Zentr.*, **11**, 3083 (1941); *cf. C.A.*, **35**, 2162⁶.]
Cholinesterase is markedly inhibited by novocaine and larocaine. This is probably connected with the favorable therapeutic experience with the combination of acetylcholine with one of these anesthetic agents in disturbances of peripheral circulation (Ratschow).
RUTH BERGGREN (Chem. Abstr.).

The Effect of Atabrine on Choline Deficiency in the Young Rat. Hegsted, D. M., McKibbin, J. M., and Stare, F. J. [*J. Nutrition*, **27**, 149–53 (1944).]
The inclusion of atabrine in low-choline diets at a level of 65 mgm. per cent. almost completely prevents hemorrhagic kidneys in the rat. A level of 40 mgm. per cent. prevents death, but allows some kidney damage to develop. No lipotropic action was observed at these levels.
GERTRUDE PARKINSON (Chem. Abstr.).

Addiction to Benzedrine and Pervitin. Hansen, P. From. [*Ugeskrift Laeger*, **106**, 95–9 (1944).]
Hansen reports four cases of addiction to benzedrine. He reviews the pathological picture of chronic addiction to benzedrine and pervitin, and points out that the tolerance to these drugs becomes considerably greater with use, with the result that larger doses are needed. Excessive use results in chronic intoxication and often leads to psychosis. Results are desiccation and loss of weight. Abstinence symptoms are not pronounced, but the risk of recidivation is great. Not infrequently the use of these drugs is combined with the use of hypnotics or sedatives, so that a vicious cycle is set up. Hansen also discusses the indications for utilization of the drugs of the benzedrine group. GERTRUDE E. PERLMANN (Chem. Abstr.).

Action of Glyceryl Trinitrate on Chronaxia of the Snail Foot. Hazard, Rene, and Jequier, Robert. [*Compt. rend. soc. biol.*, **135**, 1086–9 (1941); *Chem. Zentr.*, **11**, 2925 (1942); *cf. C.A.*, **37**, 5139⁸.].
In concentrations of 1 : 150,000–1 : 10,000 glyceryl trinitrate has a stronger action than $NaNO_2$ and increases the chronaxia of the snail foot. Paradoxically concentrations of 1 : 5,000–1 : 2,000 have less effect. A 1 : 1,000 solution renders the muscle non-irritable. $NaNO_2$, 1 : 1,000 has a diphasic effect. L. E. GILSON (Chem. Abstr.).

The Action of Theophylline and Other Drugs on the Blood Circulation in Brain. Noell, W. [*Z. ges. exptl. Med.*, **110**, 589–600 (1942); *Chem. Zentr.*, **11**, 2495–6 (1942).]
Theophylline, which causes a dilatation of the cerebral vessels, has a stronger action than caffeine but is less active than nitrite. The influence of deriphylline, euphylline, theophylline-isopropanolamine and theocin Na aceticum was insignificant. If equimolecular doses of isopropanolamine, diethanolamine and ethylenediamine were administered, only the latter was active. It is concluded that in the preparations euphylline and deriphylline, theophylline acts in a favorable way, whereas in theophylline-isopropanolamine the action can be attributed to the theophylline entirely. GERTRUDE E. PERLMANN (Chem. Abstr.).

5, 5-Diphenylhydantoin and Its Na Salt, Antiepileptics but not Hypnotics. Cheymol, J. [*J. pharm. chim.* (9), **2**, 305–9 (1942); *Chem. Zentr.*, **11**, 2496 (1942).]
Hydantoin derivatives (Na diphenylhydantoin) are good antiepileptics without the hypnotic action of barbituric acid compounds. The excitability of the motor cortex is not influenced; the rheobase is not changed; the chronaxia is decreased. If the drug is administered intravenously, the circulation is depressed. Na diphenylhydantoin is insoluble in ether and benzene, slightly soluble in EtOH, soluble in water (pH 11·7), dissociated by acids and CO_2. Diphenylhydantoin is water-insoluble, stable. The hydantoins are less well borne, but not as poisonous as barbiturates. GERTRUDE E. PERLMANN (Chem. Abstr.).

Action of Atabrine on the Electro-cortical Potentials. Pick, E. P., and Hunter, J. [*J. Pharmacol.*, **80**, 354–61 (1944).]
Atabrine in doses of 5–20 mgm./kgm. given intraperitoneally or intravenously can alter the electrocorticogram of the cat under nembutal anesthesia. Tracings are shown. The effect is central depression, and seems to be independent of the concentration of atabrine in the blood but related to the atabrine content of the brain. A depressant action was also observed in pithed frogs after injection of 0·5–2·0 mgm. L. E. GILSON (Chem. Abstr.).

Relation of Drug Addiction to the Autonomic Nervous System: Results of Tests of Peripheral Blood Flow. Himmelsbach, C. K. [*J. Pharmacol.*, **80**, 343–53 (1944).]
The resting blood flow to the hands of morphine addicts and post-addicts is subnormal, while that of habitual marihuana users is normal. Morphine significantly increases the rate of

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blood flow to the hand and forearm. The total increase in the first hour after injection is greater with 10–20 mgm. of morphine than with 40–60 mgm. The effect on the hand seems to require intact sympathetic nerve control. Demerol also increases blood flow to the hand.

L. E. GILSON (Chem. Abstr.).

The Blood-brain Barrier and Cerebrospinal Fluid in Relation to the Efficacy of Sleeping-sickness Drugs. Lourie, E. M. [*Trans. Faraday Soc.*, **39**, 340–7 (1943).]

It is pointed out that in the first stage of sleeping sickness the infection is practically limited to the blood and the lymphatic system. In the second stage some of the trypanosomes enter the substance of the brain, and in this case an administered drug must find its way, or exercise its influence, beyond the blood-barrier brain. Some facts and opinions are reviewed under the following topics: (1) Localization of the blood-brain barrier and its relationship to the cerebrospinal fluid; (2) the need of a technique for determining the ability of trypanocides to appear beyond the blood-brain barrier; (3) examination of trypanocidal power of the cerebrospinal fluid after intravenous treatment; and (4) factors determining the ability of substances (*a*) to penetrate the blood-brain barrier and (*b*) to appear in the cerebrospinal fluid.

VICTOR R. DEITZ (Chem. Abstr.).

Action of Acrichine on Parenchymatous Organs and the Nervous System (Experimental-morphological Studies). Dubovskaya, R. S., and Balanina, N. V. [*Therap. Arch.* (*U.S.S.R.*), **19**, 354–9 (1941); *Chem. Zentr.*, **11**, 2817 (1942).]

Intravenous injections of therapeutic doses of acrichine in amounts of 2–2·5 mgm./kgm. over a period of seven days produced morphological changes in the organs; this indicates a stimulation of function of the active connective tissues and the protective reaction of the organism (significant amounts of macrophages in the spleen with a high iron pigment content, aggregation of hystiocytes and satellites in the region of the heart ganglion, proliferation and hypertrophy of the Hortega cells). With the introduction of subtoxic doses of acrichine in amounts of 3, 4, 5 mgm./kgm., especially with repeated injections, the blood-vessel walls (increased permeability) and the elements of the active connective tissue were affected. In toxic doses acrichine exerted a direct toxic action on the vegetative nervous system, especially on the ganglion cells and heart plexus.

HELEN LEE GRUEHL (Chem. Abstr.).

Action of Desoxycorticosterone Acetate on the Nervous System. Chauchard, Paul. [*Compt. rend. soc. biol.*, **137**, 175–6 (1943).]

In normal rats and guinea-pigs the intraperitoneal injection of 0·04–0·20 mgm./kgm. slightly decreases peripheral and central nerve chronaxia, while 2 mgm./kgm. causes general depression with a large increase in nerve chronaxia. All doses decrease muscle chronaxia. Doses up to 1 mgm./kgm. restored normal chronaxia in nerve centres depressed by avitaminosis C.

L. E. GILSON (Chem. Abstr.).

Pharmacology of the Nitrate of Choline Perchlorate. Carr, C. Jelleff, Bell, Frederick K., Evans, Wm. E., jun., and Krantz, John C., jun. [*J. Pharmacol.*, **80**, 171–5 (1944).]

The nitrate ester of choline perchlorate (I) m. 188–9° is stable in air. A saturated aqueous solution at 20° contains 0·8 gm./100 c.c. A 1 per cent. solution dropped in the rabbit's eye produces miosis. (I) is about 10 times as toxic as acetylcholine (II) in rats. Its depressor activity is about half that of (II), and is abolished by atropine, but not by cholinesterase, and remains unchanged upon incubating an hour with dog blood serum. In rats the injection of 1–40 mgm./100 gm. produces chromodacryorrhea (red tears) within 1 minute; this is prevented by intraperitoneal injection of atropine sulfate (10 mgm./100 mg.).

L. E. GILSON (Chem. Abstr.).

Action of Morphine on the Central Nervous System of the Cat. Wikler, Abraham. [*J. Pharmacol.*, **80**, 176–87 (1944).]

Experiments were made on intact, acute decorticate, acute hypothalamic, acute decerebrate, acute spinal and chronic spinal cats in an effort to determine the mechanism and loci of action of morphine.

L. E. GILSON (Chem. Abstr.).

Tetany. III: The Action of Metrazole on Blood Glucolysis. Robuschi, Luigi. [*Biochem. terap. sper.*, **28**, 39–50 (1941); *Chem. Zentr.*, **11**, 1531–2 (1941).]

The addition of metrazole (I) to whole blood or washed erythrocytes *in vitro* causes a decrease of glucolysis, of the formation of lactic acid and of the glucolytic quotient. Low concentrations of (I) cause increase of the glucose metabolism without affecting the glucolytic quotient. Intravenous injections of 20 mgm./kgm. of (I) in rabbits attenuate the glucolytic activity of the blood; it remains uncertain whether this is a direct action of (I) or is secondary to the hyperglucemia and change in blood-cell count. (*Cf. C.A.*, **34**, 5540.[6].)

A. E. MEYER (Chem. Abstr.).

Comparative Studies of the Action of Various Analeptics on Convulsions and Blood Pressure. Hahn, F. [*Arch. exptl. Path. Pharmakol.*, **198**, 491 (1941); *Klin. Wochschr.*, **21**, 867 (1942); *cf. C.A.*, **38**, 2109[8].]

The actions of various intravenously administered analeptics with regard to the production

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of convulsions and effect on the blood pressure were compared with metrazole (I) in cats with vagi cut and carotids clamped during chloralose anesthesia. The action of azoman on the convulsions and blood pressure was 7·5 and 10 times that of (I) respectively. The blood-pressure curve, however, showed the same course as with (I). In the case of hexetone a marked lowering preceded the rise in blood pressure. Convulsant and pressor activity corresponded to 3·5 times that of (I). With the same dosage caffeine produced the same increase in blood pressure as (I). Here, too, a steep, deep but brief lowering of the blood pressure preceded the increase. (I) had a 5-fold greater effect on blood pressure than theophylline. The convulsant and pressor activity of (I) was exceeded 30- to 35-fold by picrotoxin. The effect lasted ten times as long. In the region of non-convulsant doses the action of strychnine on the blood pressure was uncertain. In the case of coramine the course of the blood-pressure curve was variable; the convulsant dose was 5 times greater than that of (I). The convulsant action of neospiran was 5–6 times greater than that of (I); small doses frequently caused a lowering of the blood pressure, while larger doses produced first an increase, then a decrease in blood pressure. The convulsant activity of (I) was three times that of cycliton. Small doses of cycliton caused only a lowering of the blood pressure. The experiments showed that the analeptic agents have very different points of attack; this must have practical significance. RUTH BERGGREN (Chem. Abstr.).

Detoxification of Metrazole. Fournier, Gabriel. [*J. Hotel-Dieu Montreal*, **12**, 112–15 (1943).]
Albino rats of 170–195 gm. weight were divided into three groups, one undergoing hepatectomy, another bilateral nephrectomy, and the third acted as control. Injection of 20 mgm. in one dose, 10 mgm. given initially followed by two 5-mgm. injections at hourly intervals, or 0·8 mgm. per gm. of weight, in all three cases showed no significant differences in the mortality of the three groups. The traumatic factor was eliminated by comparison with a group which had undergone laparotomy. It is concluded that the liver and kidneys play no role in the detoxification of metrazole. H. LEVERNE WILLIAMS (Chem. Abstr.).

Metrazole and the Differential Diagnosis of Comatose Conditions. Heinrich, A. [*Klin. Wochschr.*, **21**, 1106–7 (1942); *Chem. Zentr.*, **1**, 976 (1943).]
In intoxication with narcotics, EtOH or alkaloids a rapid intravenous injection of 1–3 c.c. of metrazole (10 per cent. solution) produces increase in pulse rate and a temporary opening of the eyes but never convulsions. In many other comatose conditions the same doses cause convulsions, motor restlessness, vomiting, trismus or cyanosis with temporary arrest of respiration. This is the case in diabetic and uremic coma, in hypoglucemic conditions, meningeal and cerebral apoplexy, and after concussion, epileptic attack and Co poisoning. Recommendations for differential diagnosis are: 50 to 100 c.c. of 35 per cent. glucose given intravenously to exclude hypoglucemia, followed by metrazole (1–3 c.c.) if no response was obtained. If no general reactions follow, a narcotic poisoning may be suspected; this is confirmed if a second injection of 3–5 c.c. given 15 minutes later equally fails to elicit general reactions. The method is without danger if precautions are taken against fractures and biting of tongue.
A. E. MEYER (Chem. Abstr.).

The Chemotherapy of Experimental Virus Infections. (1) *The Effect of Certain Pyrimidine Derivatives on Experimental Murine Poliomyelitis. McKinstry, Donald W., and Reading, Elizabeth H.* [*J. Franklin Inst.*, **237**, 422–31 (1944); *cf. C.A.*, **38**, 2653[9].]
It was thought that such compounds might inhibit virus growth by competing with the normal virus pyrimidine components for the synthetic enzyme systems involved. Graded doses of the compounds suspended in equal parts of distilled H_2O and mucilage tragacanth were administered by gavage to 15–20 gm. Swiss albino mice (male and female); significant prolongation of life or survival over controls was used as the criterion of therapeutic potency. Brain tissue from mice infected with the S. K. murine strain of poliomyelitis virus was used to prepare the inoculum for experimental infection, 0·1 ml. (usually 100 minute lethal dose) of freshly prepared suspension being used for each infection. The results were essentially negative, although 5 of the 42 pyrimidines investigated appeared to exert a slight favorable influence against experimental murine poliomyelitis. Substitution into uracil, e.g. alkyl, halogen, nitro or amino groups into position 5, sulfur or alkylmercapto groups into position 2, methyl groups into position 3 or into positions 1 and 3 and carboxyl into position 6 did not give compounds having anti-poliomyelitis activity, although the 6-phenyl- and the 6-methyluracil compounds showed definite antiviral action. The most effective compounds examined were the ethyl esters of 2-oxo-4-R-6-methyl-1, 2, 3, 4-tetrahydro-5-pyrimidine-carboxylic acids where R was phenyl, 4-hydroxyphenyl, n-hexyl, styryl or 3-methoxy-4-hydroxyphenyl: a number of related and unrelated substituents for R gave compounds which were either inactive or only slightly effective.
EDWARD B. SANIGAR (Chem. Abstr.).

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THE
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Part I.—Original Articles.

WHAT IS MEANT BY PERSONALITY?

By E. L. HUTTON, M.B., B.S., D.P.M.
Burden Neurological Institute.

THE word " personality " is being used in psychological medicine with increasing frequency. Personality tests are now to a large extent replacing pure intelligence tests, the term is frequently encountered in psychological papers, monographs and text-books, and one modern journal is even entitled *Character and Personality*.

Of recent years, following the introduction of the operation of prefrontal leucotomy, the word " personality " has acquired an even greater importance, for it is generally agreed that while the intelligence appears to be relatively unaffected by this operation, there are undoubted changes in the personality of the patients so treated, as for example a loss of self-consciousness, a slight tactlessness in their social relationships, a tendency to live in the present and to let the future take care of itself, and in varying degrees some reduction of initiative and originality.

Before embarking on a discussion as to the nature of the changes induced by leucotomy, it was felt advisable to write a preliminary paper defining more accurately the " key-word " of the whole problem, namely, " personality," and this must be the excuse for offering a paper concerned almost entirely with the definition of words to a journal devoted to mental science.

Personality is a word which is frequently used at the present time, but it is obvious as soon as attention is paid to the contexts in which it is used that the meanings assigned to it are extremely diverse, and sometimes even contradictory. As Hodgson justly remarks, " the word ' personality ' is one of those slippery words of which one has to be perennially cautious ; which mean one thing at one time and another at another, one thing to this man and another to that. Perhaps it is just because of this that it often seems to provide us with so satisfying a solution of profound mysteries, for it buries them in the depths of its own indeterminateness." The same point is also stressed by Nicodemus (1) in his essay on " Personality " ; he points out that the terms individuality and personality are " employed, even by the erudite, with an extreme laxity, and often as though they were interchangeable. They are further confused by the introduction of a third category, employed with no less laxity, that of character. It is common to hear individuality, character and personality ascribed to the same person indiscriminately, and in, apparently, the same sense. It seems, therefore, of prime importance firstly to define these terms, and, secondly, to attempt to ascertain what the transition between individuality, character and personality implies." While agreeing for the greater part with the definitions given by Nicodemus in his essay, it is felt that there is need for even greater clarity in the precise determination of the elements of meaning peculiar to these, and other terms descriptive of human beings, if those who use them are to avoid misunderstanding, inexactitude, tautology or redundancy.

In order to illustrate the diversity of meaning which has been attributed to " personality," here are a number of definitions selected more or less at random from modern authors. This is not meant to be an exhaustive list of definitions, nor has any attempt been made in this paper to deal comprehensively with the many books and papers dealing with personality and its problems.

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1. Personality is the pattern of behaviour which the individual exhibits in adjusting and reacting to his environment. (Paterson.)
2. The key to the nature of personality . . . lies in the nature of interpersonal consciousness, or in plain terms in the nature of friendship. . . . It not merely implies but is constituted by self-consciousness. (McMurray (1).)
3. Personality is consciousness of individual identity and distinction, yet with a social content. (Davies.)
4. Personality is the final differentiation which the individual has made, as it were, and produced in himself and superimposed upon all that he has inherited from past generations and lower forms of mental evolution. (Brown.)
5. Personality is the emergent synthesis of the psychological attributes of the individual in relation to the environment, . . . a process but not a product. (Gregory.)
6. Personality includes the character and the ego. It involves all the heredity of the individual, and all the modifications which have been imposed upon the individual from his environment. (Gordon.)
7. Personality is the highest realization of the inborn distinctiveness of the particular living being. (Jung.)
8. A person is a centre of liberty which confronts things, the universe, God, talks with another person, communicates with them by intelligence and affection. (Maritain.)
9. Personality is something that only exists between people, and which cannot exist in the individual in isolation. (McMurray (2).)
10. The personality can only be realized through self-transcendence. (Berdyeav (1).)
11. Man is a personality not by nature but by spirit. By nature he is only an individual. (Berdyaev (2).)
12. Personality is the universal in an individually unrepeatable form. (Berdyaev (3).)
13. Personality is not a substance but an act, a creative act. (Berdyaev (4).)
14. Personality is not a biological or a psychological category but an ethical and spiritual. (Berdyaev (5).)
15. Personality is the coming into being of the future; it consists of creative acts. (Berdyaev (5).)
16. Personality is bound up with love. . . . Love is the path to the realization of personality. (Berdyaev (6).)
17. The only bond between persons is love . . . he liveth best and hath the greatest personality who loveth best. (Jevons.)
18. It is in those human activities which are distinctively human, because they are rational and social, that we must study the nature of human personality. (Webb (1).)
19. Personality is no doubt a condition of the existence of Science, but Personality is omitted from the account which Science gives of its conclusions. (Webb (2).)

Although this paper is primarily concerned with the definition of personality, it is felt that this cannot be done without defining other closely related words, namely, individuality, character, I or ego, and self, so as to determine the essential distinctions between their meaning and that of personality. In order to do this it is necessary to study the origin and history of words, and the ways in which their meanings have subtly altered with the passage of time. Confusion of thought frequently arises from the ambiguity of the words used to express the thought, yet at the same time the essential distinction between a living and a dead language is the fact that in the former words assume new meanings, derived or abstracted from the old, though in the course of time the link between them, to which the new word actually owed its birth, may be forgotten. The word "blitz" gives an excellent example of this; to most English people it now signifies a German air-raid, and probably many who use it in this sense are unaware that the original meaning of the word is lightning, and that it was only through its linking with *Krieg* in the phrase *Blitzkrieg* and the associations of this with aerial warfare that the word came to be used in the modern English sense. The new word was not an

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arbitrarily chosen symbol, but grew organically out of the meaning and associations of the old word. Because of this gradual change in the meaning of words with the passage of time a great deal of attention will be paid to etymology in this paper.

Individual and Individuality.

In defining the word " individual " the *Oxford Dictionary* first treats it as an adjective, thereby stressing the fact that the use of the word as a noun is secondary; and is indeed an abstraction from the primary adjectival form. Concretely speaking there is no such thing as an individual, there are only individual things ; and an individual thing is one which in substance or essence forms an indivisible entity. It is that which cannot be separated, inseparable ; something existing as a separate indivisible entity ; numerically one, single, as distinct from others of the same kind. When treating the word individual as a noun the *Oxford Dictionary* defines it as follows : Inseparable thing ; a single object or thing, or a group of things forming a single complex idea, and regarded as a unit ; a single member of a natural class, collective group or number ; a single human being, as opposed to Society, the Family, etc. ; without any notion of contrast or relation to a class or group, a human being, a person.

It will thus be seen that when finally the word individual is made synonymous with human being or person, this is only achieved by the substitution, in the interests of economy, of a noun abstracted from a condensation of the phrase " individual man." It could equally well have been made to serve as a synonym for any other indivisible entity, e.g. an individual penny or an individual dog, though of course it never has been used in this way. If there is really no difference in meaning between " individual " and " man " or " human being " the phrase individual man is pure tautology, but this is obviously not the case since the word can be used meaningfully in phrases such as " individual penny " or " individual family," etc. Thus if the word individual is used simply to designate a human being, and not a human being considered from the specific aspect of an indivisible entity and from this aspect only, the word is superfluous, and could and should be invariably replaced by the words " man " or " human being."

This leads to the further question of what the phrase " a human being considered from the specific aspect of an indivisible entity " does or should mean. It is perhaps easiest to attack this by way of analogy. An individual penny is an object made of a specific metal or metallic alloy, of a specific average weight and shape, and carrying a specific type of image and superscription. These are the inseparable essentials of a penny ; if, while keeping the weight, size, image and superscription identical, tin is substituted for copper the object ceases to be a penny ; and so on with all the other basic elements of the coin. This it is which makes the penny an individual, makes it distinct, but it is to be noted that the *Oxford Dictionary* goes on to say, " distinct from others of the same kind," and the use of the word *same* is important. The identity is due to the fact that all members of the group must have the same basic essential elements in order to belong to the group at all. Thus although the individual is considered as a single unit, distinct from all the other members of the group, it is nevertheless in virtue of its identity with them, and not its differences from them, that it is considered as an individual of that particular group. As individuals of a group the units are equivalent or identical in value, and can be substituted for one another. Thus all pennies considered simply as individual pennies are equivalent, and although there are necessarily variations between them, as long as the basic essential elements are inseparably united, the variations between them can be disregarded, and it does not matter whether the image is that of Queen Victoria or of King George, or the date 1893 or 1914, the penny is still an individual penny.

Similarly, in so far as a human being is regarded as an individual, reference should be limited to those aspects in which he is identical with other human beings, and not to those qualities wherein he differs from them. The difficulty, of course, lies in determining what are precisely the basic elements, corporeal, mental, and spiritual, which must be inseparably present before a particular entity can be designated as a man, but once this has been done, all individuals included within the group must be regarded as equal. It is with human beings regarded as individuals that equality has to do—equal rights, equal opportunities, and equal respon-

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sibilities. It is as a separate entity, distinct from others, that man exists as an individual on equal terms with his fellow men, and capable of being substituted by them or for them. Thus in the issue of rations every man is considered as an individual, and the allowance is identical for all individuals of the same group, whether he be saint or sinner, genius or fool; it is as an individual that man has a vote, or competes as a "hand" in the labour market.

The important point to be stressed is that as an individual the human being is considered as separate from his fellow human beings. The development of this notion of separateness from others, necessarily associated with the inseparability and indivisibility of the individual entity, has given rise to the notions inherent in individualism, viz.: (1) Self-centred feeling or conduct as a principle, a mode of life in which the individual pursues his own ends or follows out his own ideas; free and independent individual action or thought; egoism. (2) The social theory which advocates the free and independent action of the individual, as opposed to communistic methods of organization and state interference. (3) *Metaphorically*. The doctrine that the individual is a self-determined whole, and that any large whole is merely an aggregate of individuals, which, if they act upon each other at all, do so only externally. (*Oxford English Dictionary*.)

Individuality is, of course, a further abstraction made via the noun and the adjective. In view of what has been said above concerning the equal rights, opportunities, and responsibilities of individuals, it seems appropriate to quote here the second definition given by the *Dictionary*: "The fact or condition of existing as an individual or corporation (artificial person) having rights and duties recognized by the law."

Character.

If the *Oxford Dictionary* be consulted it will be noted that no reference has been made in the foregoing to the fourth definition of the adjective individual, viz. "distinguished from others by attributes of its own, marked by a striking and peculiar character." The omission was deliberate because the use of the word in this sense seems to be unfortunate and misleading, and the difficulty could be avoided by the use of the word "character," which is used in the dictionary definition of this meaning.

Although it is easy to see how this meaning has arisen, how the idea of being separate from other individuals of the same group has been brought into the foreground and given the predominant place, at the expense of the idea of the sameness or identity of the indivisible units of the same group, it is misleading because it conveys the impression that the distinction from the other individuals is the prime meaning of the word, whereas it is secondary, and it is unfortunate because the word character can express this idea of uniqueness of difference from other individuals, while there is no other word which can appositely express the idea of an *indivisible* entity of the *same* kind. It is therefore desirable that the word individual should be retained for the latter meaning, and the word character substituted for the former.

This leads to the discussion of the origin and meaning of the word character. According to the *Oxford Dictionary* it comes from the Greek verb meaning "to cut furrows in, engrave." The Greek noun derived from this verb apparently meant either the instrument for marking or graving, or the impress, stamp or distinctive mark so made.

The earliest English usages were in this same literal sense, and it was not until later that the figurative meanings were abstracted. Originally, then, the word meant a distinctive mark, impressed or engraved; a brand or stamp; after this use was extended to mean a graphic sign or symbol, then more specifically a letter of the alphabet, and finally writing or printing. Figuratively, too, the word originally meant a distinctive mark, evidence or token, a feature, trait, characteristic; later, the aggregate of the distinctive features of anything, essential peculiarity; then the face or features as betokening moral qualities, the personal appearance; the sum of mental and moral qualities which distinguish an individual or a race, viewed as a homogeneous whole; moral qualities strongly developed or strikingly displayed, distinct or distinguished character. Still later the word was extended to mean person, especially one with distinctive attributes, and so odd or eccentric, or else as portrayed by a novelist or dramatist.

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As with the word individual, so here also the term character was originally applied to objects, and can still be so used. The individual penny may have a character in addition to its individuality, if the word is used in the sense of "a distinctive mark or feature," or "the aggregate of the distinctive features of anything"; thus a worn penny of the year 1869 has a different character from one newly minted in 1944.

It will be noted that when the word is restricted in its application to human beings a new twist is given to the meaning by the introduction of the word moral. "A man of character implies, not only one of defined individuality, but also one of deliberate self-limitation, selection, and repression. . . . In other words the unique individual pattern is limited by the conditions in which it takes form, by heredity and environment, by choice and by circumstance. . . ." But the term "character" implies a further and a wilful limitation, a limitation of choice. For the individual, set amid circumstance, is not only limited by his conditions, he also deliberately limits himself by the exercise of his free will. If he is to act he must do so. From a variety of possible courses of action he chooses one; from a multiplicity of sensations and impulses he selects some and rejects others in accordance with a dominant motive (Nicodemus (2)). A similar definition is given by Brunner (1): "By character we understand, first of all, that which distinguishes human beings from one another, not, however, merely 'natural' differences —or differences of individuality—but those which are due to self-determination, to the imprint which is due to man's own reaction as a whole."

The word character is, therefore, eminently suitable for signifying those qualities which make an individual unique, which distinguish him from other individuals who are fundamentally identical with him. Since in man this differentiation is not only imposed on him by his heredity and environment, but is also in part self-created, it must necessarily carry with it a moral connotation.

Used in the sense of "the sum of the qualities, physical, mental and moral, viewed as a homogeneous whole, which distinguish an individual," the word character seems adequate for many of the definitions of personality given by psychologists, and quoted at the beginning of this paper. Further, the substitution of the word character in these definitions would help to eliminate much of the confusion associated with the word personality. I propose, therefore, to substitute the word in those definitions where it seems advisable to do so:

(1) Character is the pattern of behaviour which the individual exhibits in adjusting and reacting to his environment.

(2) Character is the final differentiation which the individual has made as it were, and produced in himself, and superimposed upon all that he has inherited from past generations and lower forms of mental evolution.

(3) Character is the emergent synthesis of the psychological attributes of the individual in relation to his environment . . . a process but not a product.

(4) Character involves all the heredity of the individual, and all the modifications which have been impressed upon him from his environment.

The word character, however, does not seem applicable to those definitions made by philosophers and metaphysicians; hence it seems probable that Berdyaev (5) and Webb (2) are right when they maintain that "personality is not a biological or psychological category but an ethical and spiritual," and that "Personality is omitted from the account which Science gives of its conclusions." Whenever psychology is, or aspires to be, entirely scientific, it can only give an account of individuality and character and not of personality. This point will be discussed more fully during the definition of the word personality.

Ego, I, and Self.

It seems sufficient for present purposes to discuss the meaning of these words from a rather limited standpoint, namely, that of differentiating between the synonymous use of the Latin ego and the English I, and that of the word self. The distinction has been pointed out in a slightly different context by Bowman: "In actual usage the words 'mind' and 'soul' differ from 'subject,' 'person,' 'agent' and 'conscious being,' in that we commonly represent the former as

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possessions, whereas we identify ourselves with the latter. I have a soul and a mind, but I *am* a subject, an agent, a person." Similarly one uses the possessive pronoun with self, myself, yourself, himself, herself; and although, owing to the development of language with its subtle change in the meaning and use of words, we do now frequently use a possessive pronoun with ego, my ego, your ego, etc., there is no corresponding usage with I, and we do not say " my I " or " your I." Further, although we can qualify I by self, I myself, we cannot substitute self for I, and instead of " I think " write " self think."

It is important to stress this distinction, because many psychologists, and especially empirical psychologists, confuse the two. This confusion is revealed in the following passage by James: " Now what is this self of all other selves? They would call it the *active* element in all consciousness. It is what welcomes or rejects. It presides over the perception of sensations, and by giving or withholding its assent influences the movements they tend to arouse. . . . It is the source of effort and attention, the place from which appear to emanate the fiats of the will. A physiologist who should reflect upon it in his own person could hardly help, I should think, connecting it more or less with the ' process ' by which ideas or incoming sensations are ' reflected ' or pass over into outward acts. . . . It is opposed to them as the permanent is opposed to the changing and inconstant. . . . Some would say it is the soul, others a fiction. . . . For this central part of the Self is felt, it is something with which we have direct sensible acquaintance." Would it not be infinitely simpler and clearer to write " I " instead of " this self of all other selves." " I " am " the active element in all consciousness," the subject, the agent, the actor, " the permanent as opposed to the changing and inconstant "; " I " am pure subjectivity, pure activity, " I " can only be felt subjectively, " I " cannot be apprehended objectively; " our direct sensible acquaintance " with it is only through pure subjectivity. Self, on the other hand, can and must be thought of objectively; self is the instrument, the means whereby " I," the actor, realize my activities. " I " am permanent and unchanging, but my " self " is changing and inconstant. It is owing to this confusion that " some would say it is the soul, others a fiction." It is equally as erroneous to equate " I " with the soul as to equate it with the self, for, as Bowman rightly stresses, I have a soul, but I am I, " I am that I am." Any attempt to equate " I " with soul or self is an attempt to apprehend " I " objectively, but there is no objective " I," and any statement or assertion that an objective " I " exists *is* pure fiction. It cannot be stressed too emphatically that " I " cannot be apprehended in objective terms, but can only be experienced and known subjectively in pure activity; it is in a different category from everything else except " Thou," for only these two, " I " and " Thou," are permanent and unchanging, while everything else is changing and inconstant. (For those who are interested in this relationship of I and Thou Dr. Buber's (1) book is to be recommended.)

When discussing the meaning of individual it was admitted that the difficulty lay in determining what are the basic elements, corporeal, mental and spiritual, which must be inseparably present before a particular entity can be designated as a man, but surely all will agree that " I myself " is the irreducible minimum; neither the " I " nor the " self " separated from each other can be considered as an individual, as a human being. The individual comprises both the " I " and the " self," and it is to this surely that the following statements refer. " The timeless element in individuality is, therefore, if we accept these authoritative conclusions, not the individual *itself* (the italics are mine), but rather the principle of being (i.e. the " I," the active element) which begets such individual patterns. It is not the individual patterns, the self, but the Being which begets self which is timeless " (Nicodemus (3)).

It is a paradox which Count Hermann Keyserling noted in his profound essay upon " Immortality." " The individual is more than it appears," he wrote. " It is not merely the embodiment of the empirical moment, it is not merely transient, mere phenomenon; it is at the same time the eternal process. . . . The nearer we drew to the meaning of the individual and the more we grasped at its transitory character, the more vivid at the same time became our knowledge that its essence was indestructible. . . . The ' Being ' of life expresses itself in change, in motion, in perishing. . . . Only in this flux of Becoming does permanent Being make itself known."

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PERSON AND PERSONALITY.

" The history of the word *persona* outside ecclesiastical use is clear. First, it is an actor's mask, then by an easy transition, the part an actor plays, which is represented by his mask ; then any part or role assumed by anyone without any regard to its duration. Secondly, it is the *condicio*, *status*, *munus*, which anyone has in general, and in particular in civil life. And so it is the man himself in so far as he has this or that *persona*. Thus slaves . . . were regarded by the Roman law as not having *persona* " (Bethune-Baker).

" But while the original and secular connotation of the term is thus clear, it is one which, in the clash of religious controversy, has undergone an intense and prolonged deepening and development. . . . In the full, rich and final interpretation of the Church, therefore, the term ' person ' implied neither merely a name or a designation, nor a condition, but a real and eternal being or essence under varying conditions and in varying roles caused by those conditions. Thus the fundamental conception of a real being playing different parts on the stage of life and time was fulfilled and perpetuated " (Nicodemus (4)).

The same derivation is given by the *Oxford Dictionary*, where, however, a note is made that it is only lately that the word " person " has been used as a synonym for a human being in general ; in earliest use it referred to the human being *acting* in some capacity, personal *agent* or *actor*. (The italics are mine.)

In the discussion on I and self the conclusion was reached that " I " could be defined as " the *active* element in all consciousness," the subject, the agent, the actor ; this occurrence of the one word " actor " in these two contexts gives a clue to a relationship between person and ego. It also reveals the fact that personality is essentially a dramatic and not a scientific concept, and cannot therefore be described in scientific terms. As already stated in the definitions given at the beginning of this paper, " Personality is no doubt a condition of the existence of Science, but Personality is omitted from the account which Science gives of its conclusions " (Webb (2)). Again, " Personality is not a biological or a psychological category, but an ethical and spiritual " (Berdyaev (5)).

What does one mean by saying that personality is essentially a dramatic concept? Drama is derived from the Greek verb meaning " to do," and the essence of drama is action. " To be, or not to be," cried Hamlet, but his real problem was how to act. Descartes affirmed "*Cogito ergo sum*," but should it not rather be "*Ago ergo sum*" ; not " I think therefore I am," but " I act therefore I am " ? This is true of the inorganic world, for even there the existence of any substance, object or event is known by its action. " Thinking " or " knowing " is consciousness superimposed upon this basic fact of action, and the full Cartesian formula should be, " I act therefore I am ; I know I act, therefore I know I am."

The dramatic interpretation of personality is one that has been stressed by Lloyd-Morgan (1) : " As agents we are actors on the scene of life, and view that scene and the part which we and others play in it dramatically."

It was, of course, said much earlier by Shakespeare :

> " All the world's a stage,
> And all the men and women in it merely players,
> They have their exits and their entrances,
> And one man in his time plays many parts."

Lloyd-Morgan,(1) however, elaborates this theme : " Thus to view it dramatically is a far more primitive attitude than to view it scientifically. But prior to reflective procedure there is neither the one attitude nor the other.

" It does seem to me that . . . human persons may be regarded as actors who play their parts in the drama of existence with some measure of creative activity.

" In all cases, however, it is with the acts of living agents, primarily human agents, real or imaginary, that what we commonly speak of as drama is concerned. The concept of purpose, embodied in reflective persons, is ever present. And whether the actor walks the boards of the theatrical stage, representing someone other than himself, or plays his part in real life, it is as actor, in one or both senses, that his act, the product of his creative activity, calls for explanation of the kind that I distinguish as dramatic " (Lloyd-Morgan (2)).

" Into drama as art-product we always read purpose on the part of the agents

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portrayed. Into purpose on the part of human agents, in the busy streets or sequestered lanes of our workaday world, we always read drama. On the stage of all drama there are persons who act with purpose, or beings regarded as persons who act with purpose. Of drama the key-note is purpose, and purpose implies personality" (Lloyd-Morgan (3)).

The same concept is also discussed by Urban. He maintains that poetry, in contradistinction to science, always makes "assertions about *persons*. This may seem to be the veriest platitude, but it is, properly understood, of the utmost significance, For science, rightly understood, never speaks of persons and has no interest in them as such. Indeed it has no interest in the individual as such, but only as an exemplification of a universal. 'Scientific' psychology is always psychology without a soul. Poetry, as poetry, always speaks of 'souls,' even when paradoxically, as in naturalistic poetry, it denies their existence. By this I mean that even the naturalistic dramatist, in so far as he is a dramatist, must treat the characters of the play *as though* they were persons even if he thinks they are not. Now, what is a person? The one differentia of a person that is significant is, that he alone of all the parts of nature has consciousness of values and of the 'ought' or obligation inseparable from the awareness of values." "It (poetry) says many things, but one thing it always says, namely, that human life and man are unique, free and self-determining parts of nature. The dramatic mode of representation always implies this; it is the necessary pre-supposition of all drama, and in so far as the poet employs the dramatic way of rendering life, he always says this implicitly. This is true of all drama, but it is pre-eminently true of tragedy. A naturalistic view of man—one which makes of him merely a part of nature—cannot rise to tragedy. The death of a tree or a dog cannot be tragic. It is only that unique part of nature which is the bearer of values, and of the obligation which arises from them, that can be the subject of tragedy. The 'tragic sense of life' is possible only on the supposition of the transcendence of nature, and the tragic *catharsis* is possible only when the drama expresses that transcendence."

This association of personality with obligation and transcendence is also to be found in the following passage from Tagore (1): "There is another division in man which is not explained by the character of his physical life. It is the dualism in his consciousness of what is and what ought to be. In the animal this is lacking, its conflict is between what *is* and what is desired; whereas in man the conflict is between what is desired and what *should be* desired; but what should be desired belongs to a life which is far beyond it. So in man a second birth has taken place. He still retains a good many instincts and habits of his animal life, yet his true life is in the region of what ought to be. In this, though there is a continuation, yet there is also a conflict; many things are good for the one, are evil for the other. This necessity of a fight with himself has introduced an element into man's personality which is character. From the life of desire it guides man into the life of purpose. This life is the life of the moral world. In this moral world we come from the world of nature into the world of humanity."

Kant, of course, made explicit the distinction between the world of nature and the moral world, and recognized that our knowledge of the former is mediated by the intellect and of the latter by the will, i.e. by "a free activity in virtue of which we can use our sensuous and intellectual knowledge as we please," which "brings also a sense of emancipation from the law of cause and effect which dominates the world of things as they appear to us, no less than from the laws of logical necessity which constrain the operations of the reason" (Joad).

Professor Joad has given such a concise statement of Kant's viewpoint that one feels convinced that one cannot do better than continue to quote him at length:

"Kant was then led to distinguish between two selves—the 'transcendental self' by virtue of which man participates in the world of things as they are, and 'the empirical self' which is the self of everyday experience, and is a chaos of wishes and desires. As creatures of desire we belong to the world of things as they appear, and our feelings and actions are as completely determined as the movements of matter in the physical world. But when we act in accordance with the law which our moral will prescribes, we escape from the world of appearance, and establish contact with reality. Further, the consciousness of moral obligation is inextricably bound up with the freedom of the self that wills, which is the transcendental self.

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" The consciousness of ought is not anywhere to be found in the world of things as they appear. Obligation expresses a sort of necessity . . . which occurs nowhere else in nature. It is impossible that anything in nature *ought* to be other than in fact it is. . . . In the world that we know by means of the senses and the intellect we can only find fact; such a world cannot contain a basis for the notion of ought; yet we do undoubtedly recognize oughts. Therefore the source of these oughts must lie in some world other than that revealed to the senses and known to the intellect, and it must be by means of a unique faculty that we recognize them. . . . Examine the world round us, explore physical nature, and you will accumulate information about what is; you will in short ascertain facts, but you will not discover what should be; the information that you obtain will not include oughts."

Kant himself does not, so far as I am aware, use the words " person " or " personality," but it is obvious from the above that personality is implicit in his " transcendental self " if we agree with Urban that " the one differentia of a person that is significant is that he alone of all the parts of nature has consciousness of values, and of the ought or obligation inseparable from the awareness of values."

The existence of a two-fold attitude of man to the universe, a scientific and a dramatic or mythological, is of great practical importance. In both the ego is involved, the activity of man is revealed as much in his scientific discoveries as in his art, his social life, and his religion; but the relationship of the ego to the universe is profoundly different in these two attitudes, and personality is found only in the latter.

This fact has been realized by common sense, though it has not yet been grasped by all psychologists. It is a commonly accepted dictum that a scientist, as scientist, should be impersonal, and that his personal feelings and prejudices should never be allowed to intrude upon the objective data which are under investigation by his intelligence.

Science is man's instrument for exploring the world of nature, for studying the events of the present in the light of the past, and predicting the future therefrom; its aim is the discovery of natural laws, and its conclusions are of necessity deterministic; drama and mythology are, on the other hand, man's instruments for exploring the supernatural, for studying the events of the past in the light of the future and explaining thereby the present, and its conclusions are of necessity indeterministic. " The dead and the living, men, beasts and gods, trees and stars, and rivers, and sun and moon dance through the region of *myths*—where everything may be anything, where nature has no laws, and imagination no limits " (Lang).

Science is mediated by the intelligence, but drama and myth by the personality. The following quotations from Webb (3) indicate the relationship between mythology and personality: " There is a celebrated observation of Aristotle that the lover of myths is in a sense a lover of wisdom or philosopher." " I think with him that the myth is not concerned, strictly speaking, with the same subject matter as Philosophy, but rather takes the place of History where a historical question is asked but the materials for a historical answer are missing. How did the world come into being? How did Society begin? What will happen to our souls after death? " " All the principal Platonic myths may be said to relate to the soul." " Thus to say that all the Platonic myths relate to the nature of the soul is to say that they relate to a nature which we know most intimately in a personal form, and are thus almost constrained to construe elsewhere on the analogy of our own personal life. Moreover, in Plato's philosophy it is the soul which is the source of all motion, the active principle of the whole cosmic process."

This distinction between the scientific and the dramatic or mythological approach was indicated by Kant, and the determinism of science and the indeterminism of drama and myth has also been maintained by Berdyaev (9). " The natural world is ruled by determinist and impersonal forces, and its purpose is obscure; in the spiritual world, on the other hand, freedom reigns supreme on the foundations of personality and personal relationships, and the purpose of existence is clear." Strictly speaking, it is incorrect to speak of the " purpose " of the natural world at all, for the word actually means " that which one sets before himself as an object to be attained," but has the natural world, as such, any self before which can be set the object to be attained? The word " purpose " is surely meaningless except in terms of persons whose present actions are solely determined by their future aims,

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that is by events which exist as yet only in their imaginations, but which may or may not be subsequently realized by their will.

It is for this reason that science can only study the past and predict the future, while drama and mythology, whose concern is predominantly personal, can explain both past and present in terms of the future. Science, in the heyday of its pride, claimed that when it had accumulated sufficient knowledge of the past it would be able to predict the future with absolute certainty; but now modern scientists with greater humility admit that the only thing of which science can be certain is the principle of uncertaincy or indeterminism. Is it not reasonable to suppose that in personality, where imagination and will are allied, the principle of uncertaincy is to be found; in personality as revealed by mythology, where "everything may be anything, where nature has no laws and imagination no limits."

Conjunction of imagination and effective will is the *sine qua non* of creativity, which is also one of the attributes of personality, and is entirely inexplicable on scientific grounds; as McMurray (2) says, "Personality is inherently creative." Perhaps it would be as well to make quite clear what is here meant by creativity. According to the *Oxford Dictionary* the original meaning referred solely to Divine agency, and meant "to bring into being, cause to exist; *esp.* to produce where nothing was before, to form out of nothing." E.g. Chaucer, *c.* 1386, "Al be it that God hath creat al thing in the right ordre." Later the use of the word was extended to mean generally, "to make, form, constitute, or bring into legal existence (an institution, condition, action, mental product, or form, not existing before); and finally, "to cause, occasion, produce, give rise to (a condition or set of circumstances)." The same development is shown with the noun "creation" as with the verb; it originally referred to a Divine agency, and later referred more generally to "the action of making, forming, producing, or bringing into existence"; it is also used in a more restricted sense for "an original production of human intelligence or power; *esp.* of imagination or imaginative art." Once again it seems advisable in the interests of scientific precision to use the words create and creation in the more restricted senses, and not to use them as mere synonyms for simply "making, forming, producing or bringing into existence." In this restricted sense it refers either to "the bringing into existence by the divine power," or to "an original production of human intelligence or power." It may well be that there is more than an accidental analogy or similarity between these two meanings, and indeed Berdyaev maintains that "every creative act is a spiritual act." The basis of creative activity would seem to be that it is purely an expression of the creator himself; that it is determined by nothing external to the essential nature, the essence, of the creator himself; the creation is created for no other reason but that the creator willed it to be created, and it is therefore a manifestation of himself. "The creative act of the subjective spirit is in exteriorization of self in the world" (Berdyaev (8)). This view is also expressed by Tagore (2): "In the man, the life of the animal has taken a further bend. He has come to the beginning of a world which has to be created by his own will and power. . . . For creation is freedom. It is a prison to have to live in what is; for it is living in what is not ourselves." The relationship between personality, creation, freedom and spirit has been very fully developed by Berdyaev (9) in his two books, *Spirit and Reality* and *Slavery and Freedom*, and the theme is throughout the same: "Personality is not a substance but an act, a creative act. . . . Personality is activity, opposition, victory over the dragging burden of the world, the triumph of freedom over the world's slavery. . . . Personality is effort and conflict, the conquest of self and of the world, victory over slavery, it is emancipation." "It might be said that society and nature provide the material for the formation of personality. But personality is emancipation form dependence upon nature, from dependence upon society and the state. It opposes all determination from without, it is determination from within." "Personality is the coming into being of the future, it consists of creative acts. . . . The existence of personality presupposes freedom. The mystery of freedom is the mystery of personality."

Earlier in this paper a person was described as an actor, but it must be remembered, as Garvie points out, that "action is determined by motive." "A motiveless action would be an unreasonable action, for it is no mere play of words to say that the motive is the reason for the action; it is better to say reason than cause,

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so as to preserve the personal character of conduct." In drama it is not the mere occurrence of the events played by the actors that holds our attention, for these only derive their significance from the motives that prompted them. Thus, in " Othello " it is not the fact that Othello killed Desdemona that is of importance ; had he killed her for any other motive than that of jealousy the drama would have been entirely different.

It will be noted that the words motive and emotion both have the same basic root, and they are undoubtedly closely allied in their meaning, for both refer to that which moves a man, to the determinants of his action. The dramatist is therefore portraying through his characters the forces which determine their behaviour. " The characters of a great play are symbols of the spiritual forces that sway mankind ; but they are not arbitrary or allegorical symbols; they are individual cases of what they symbolize. If they are not individual they are mere types, and our interest in them is ethical and not dramatic " (Temple).

In order that drama may reveal the motives underlying the actions which occur in the play it is necessary that the emotions, desires and beliefs of the *dramatis personae* be portrayed, and the genius of the dramatist and the actor lie in their ability to convey to their audience the subjective affective-volitional experiences of the characters they present.

A great many of the thinkers who have concerned themselves with the problem of valuation (e.g. Spinoza, Ehrenfels, Urban, Santayana, Prall, Perry and Calkin) have come to the conclusion that values are primarily subjective, and they identify valuation with feeling, willing and affirmation, either singly or in combination (Calkin). This relationship of values to subjective experiences affords a basis for Urban's statement that the person alone of all the parts of nature has consciousness of values. The same thing has been said by Hoffding : " In our experience personal beings appear in existence as centres of value, by which I mean as the living central points in which value can be felt and acknowledged. It is personality which in the world of experience invests all other things with value."

The significance of the conjunction of creativity and the perception of values in personality has been noted by Allers : " The person possesses possibilities of realising certain definite values by means of action. We may express it thus : Values that are real, but belong to the realm of ideas, can by means of human action be brought into the world of space-time, and thus for the first time fulfil their functions in the cosmic continuum."

The measure of personality thus seems to depend upon the range of the person's value perceptions and the degree to which these ideally apprehended values can be actualized by creative activity in the world of space-time. (This would apply equally to Divine or human personality.) Since, however, in human personality apprehension of values seems so closely linked with affective-volitional experiences, and since the most important of these experiences are evoked only by other persons, and not by objects, it becomes evident why " personality is something which only exists between people and which cannot exist in the individual in isolation," for the most important of all values is that which can only be fully realized between persons, namely, love. " Personality is bound up with love. . . . Love is the path to the realization of personality " (Berdyaev (6)). " The only bond between persons is love . . . he liveth best and hath the greatest personality who loveth best " (Jevons). " Personality is always social " (Webb (3)).

As affective-volitional experiences are, however, necessarily somewhat limited in any given individual, it is obvious that human beings can only penetrate widely and deeply into the realm of values if they can apprehend other values than those directly glimpsed by themselves. An interpersonal revelation of values is, however, made possible by the dramatic attitude ; if we are viewing life dramatically we are viewing it from a standpoint other than our own. In drama, as in art generally, we stand not in the centre of our own personality, but in that of the artist, revealed to us by his music, painting or poetry, or by his *dramatis personae* ; we feel with him, and in thus feeling with him we apprehend through him values which would otherwise remain hidden from us. In this way our creative potentiality becomes immeasurably increased, for these values, as well as those directly apprehended by us, may now by our actions be brought into the world of space-time.

In order to view life through the eyes of another person we must enter into the

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whole of their being as it were; we must not only feel but think and strive as they do. This can only be done by the employment of the whole of ourselves, and it is only in those relationships where all our being is involved that we can claim to be persons. The whole of nature, organic and inorganic, may be viewed in this way, and so man's relationship may be intensely personal where the other element in the relationship is strictly speaking non-personal.

In the scientific attitude, on the other hand, as has already been pointed out, feelings must be left aside, and thus in science man is not acting with the whole of himself, and it is for this reason, therefore, that the scientific attitude is described as impersonal. Moreover, just as it is possible to treat objects as if they were subjects, i.e. personally, so it is equally possible to treat persons as if they were objects, i.e. impersonally. This was even recognized by a nine-year-old child, who gave as the reason for her dislike of a new doctor that "she doen't treat you like a person, she treats you like an it." Brunner (2) draws attention to the same fact: "The peculiar element, the specific element of the species *Homo sapiens*, is this, that it is not a species in which the individual is an example, but *humanitas*, in which the individual is person. It belongs therefore to the peculiarity of this "species" that the individual is able to abandon it and to deny it, that—at least within certain limits—he can become an 'in-human' human being. That is the dangerous freedom which belongs to this independence."

To put it in other words, a person is capable of behaving impersonally; and in fact it is unavoidable, and indeed necessary, that he should on occasion adopt this impersonal form of behaviour. "Every *Thou* in the world is by its nature fated to become a thing, or continually to re-enter into the condition of things" (Buber (2)). This impersonal attitude is essential for the scientific attitude through which man learns to know and to make use of natural phenomena, and in it the subject experiences or uses an object; but in those personal relationships, which underlie the dramatic attitude, subject meets subject, and there is no trace of experiencing or making use of another.

Summary.

It has been thought advisable, in the interest of scientific precision, to define the meaning of the words individual, character, I or ego, self, and personality; and to recommend that when used for psychological purposes these words should only be used with the meanings given below. These meanings have not been arbitrarily chosen by the author, but have been selected because they seem to express most clearly the specific and intrinsic meaning of these words as revealed by their etymological development.

1. Individual: When used as a synonym for man or human being should only be used in contexts where man is considered from the aspect of a single unit, as distinct from others of the *same* kind. In this sense of the word the most important feature is the equivalence of individuals, based on their identity with others of the same kind. A man is an individual of the species *Homo sapiens* in so far as he possesses the basic qualities necessary for his inclusion within the species, and since all members of the species must possess these same basic qualities, as individuals they are equal with one another. The word should not be used, as it sometimes is, to indicate a human being who is markedly different from his fellows.

2. Character should be used for "that which distinguishes human beings from one another, not, however, merely "natural" differences—or differences of individuality—but those which are due to self-determination, to the imprint which is due to man's reaction as whole" (Brunner).

3. Ego or I: These, if used synonymously, refer solely to pure subjectivity, to pure activity. Their meaning can only be apprehended subjectively, and never objectively.

4. Self: This word should never be used as a synonym for I. Self refers to the instrument whereby the "I" realizes its activity, and the self can, and indeed must be apprehended objectively. "I" refers to that which is permanent and unchanging, while "self" refers to that which is changing and inconstant.

5. Personality: This is the most difficult to define adequately; its specific meaning is more directly recognized in general usage than in psychology. A human being can never cease to be an individual, nor can he be entirely devoid of

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character, good, bad or indifferent, but he can become impersonal. In actual fact a man does become impersonal whenever he adopts a strictly scientific attitude, for in this attitude all that is purely personal must be resolutely banished. By "purely personal" is here meant his feelings, his prejudices, his ambitions, his hopes and his fears. He must be dispassionately objective. Man as pure scientist has need of intellect, but can dispense with emotion. On the other hand, when a man is personal his emotions play as great a part, or perhaps even greater, than his intellect; when he acts as a person he acts with the whole of his being, and this he can only do when he enters into relationship with another subject, and for this he must adopt a dramatic attitude. In science a man's relationship is necessarily that of subject and object. He can only be personal in his social life, in his art and in his religion. In his social life he can enter into subjective relationship with his fellow men, in his art into subjective relationship with nature, and in his religion into subjective relationship with God. Nevertheless, his relationships with his fellow men, with nature and with God are not necessarily wholly subjective; all three, his fellow men, nature, and God, can be treated objectively, i.e. impersonally, by the adoption of the scientific attitude towards them.

For this reason personality is not a biological category, and if psychology is conceived in purely scientific terms, involving the rigorous exclusion of dramatic concepts—e.g. the Oedipus situation—neither is it a psychological category. Strictly speaking, personality is an ethical and spiritual category, and the psychologist who would study it must do so from the ethical and religious standpoint, and not from the psychological.

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A STUDY ON SOME CLINICAL ASPECTS OF THE RELATIONSHIP BETWEEN OBSESSIONAL NEUROSIS AND PSYCHOTIC REACTION TYPES.

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THE interrelationship between neurotic manifestations and psychotic reaction types represents one of the major problems of psychiatry. Psychotic reactions sometimes develop in patients with old-standing neuroses. It is also well known that neurotic symptoms are not uncommon in the preliminary stages and during the course of psychoses. However, the knowledge of the interaction between neurotic and psychotic manifestations is still incomplete. In this study an attempt is made to elucidate some of the clinical aspects of this problem. It is not intended to discuss here such basic issues as the definition of neurosis and psychosis and their interrelationship in general. Those questions have been widely debated, and it seems doubtful whether much can be gained from a continuation of this discussion at the present stage of psychiatric knowledge. In a clinical study the question whether or not there is a fundamental difference between neurotic and psychotic symptoms and behaviour is better left open. An investigation into the interplay between various phenomena of mental illness occurring in individual patients is justified, even if one looks at them as manifestations of a single and continuous development.

The investigations presented in this paper have been concerned with the relationship of obsessive-compulsive (or in short obsessional) symptoms to the non-organic psychotic reaction types. A good deal of confusion about this relationship was caused by carelessness of definition and the vagueness of the conception of psychasthenia now becoming obsolete. In this paper only such symptoms are described as obsessional or obsessive-compulsive which fall strictly within the modern definition commonly adopted (K. Schneider, A. Lewis, Henderson and Gillespie, a.o.). Various and contradictory views on the relationship between obsessional symptoms and psychotic reaction types have been expressed. Bonhoeffer (1913), Stoecker (1914), Abraham (1925) a.o. assumed a close connection between obsessional phenomena and the affective reaction types, particularly the depressive states. Slater's (1943) studies on the neurotic constitution seemed to confirm that view. Bleuler (1917), K. Schneider (1925), Meyerson (1925), Jahrreis (1926), Woolley (1930) a.o. held the opinion that there was a close relationship to schizophrenia. Gordon (1928), A. Lewis (1934, 1936), Bowlby (1940) a.o. demonstrated that obsessional symptoms occur in association with either reaction type. Systematic heredity studies in cases with obsessional symptoms are still scanty. Kahn (1931) a.o. maintained that there was an independent heredity determinant, the " anancastic " (i.e. obsessional) constitution. A. Lewis's (1936) investigations into the heredity of cases with obsessional illness lent support to this assumption. Hoffmann (1927), Kehrer and Kretschmer (1929) pointed out that the hereditary predisposition to obsessional symptoms may coincide with predisposition to affective as well as schizophrenic reactions or with both.

Some authors were interested in the question whether obsessional ideas could develop into delusions. Harrowes (1931), Zilboorg (1931), Miller (1940) a.o. have described the development of psychotic reaction types in patients previously suffering from neurotic symptoms in the light of the principles laid down by A. Meyer (1912). Freud (1915), Abraham (1927) and Glover (1935) have made important contributions to the knowledge of the deeper structural relations between

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obsessional neurosis and depression. Mayer-Gross (1928), Kahn and Cohen (1932), Vurpas and Corman (1933) and Lion (1942) have studied special aspects of the problem. However, little attempt has been made to co-ordinate the various observations, and some important aspects have not been sufficiently studied, such as the question whether the interaction of obsessional symptoms and psychotic reactions does not result in a modification of the latter with regard to symptomatology and prognosis; the question of the fate of the obsessional symptoms in the course of an ensuing psychosis; the borderline cases, etc. Those and other questions are to be discussed in this article on the basis of a representative case-material and of cases reported in the literature. The material presented consists of cases in which symptoms of obsessional illness had been present prior to the development of a psychotic condition. Only two of the cases presented in full were not investigated by the writer himself. Owing to war-time difficulties it was not possible to carry out a follow-up study or to investigate into the heredity factors fully.

CASE 1.—Miss J. F. R—, born 1882. A maternal aunt committed suicide in a state of involutional melancholia. A cousin died in a mental hospital in a delirious condition. Another cousin suffered from periodical depressions. The patient's sister was treated in Jordanburn Hospital for an agitated depression at the age of 40. She made a full recovery. The patient was from childhood handicapped by severe short-sightedness. At the age of 4 she had to be kept away from other children, as she had a habit of giving them sly, vicious kicks. The patient remembered that she either kissed or kicked them. In her early school years she was ill-treated by a teacher, who was expelled for cruelty to the children, and all her life she had felt the desire for revenge. She was of a happy disposition, very sociable and active. She always was overfussy, pernickety and excessively clean. She spent hours dusting and polishing. Since childhood she had had mild phobias, such as a fear of beetles, mice and rats. Later she had the fear of being buried half-alive in case of illness and of finding herself surrounded by worms and rats. In view of her later symptoms it was noteworthy that she had always had a phobia of breaking things. She could not see a piece of china standing near the edge of the table. She also was extremely anxious to avoid doing harm to any living thing. She would stop people killing flies and mice, and she would rescue flies drowning in the milk. All those obsessional traits were mild, and did not interfere with her happiness in the intervals between her recurrent depressions (see below).

Sex life: At the age of 30 she entered into relations with a man considerably younger than herself. She mothered him. She gave him up after some years. From the age of 38 she had been living with a widower. At 40 she had a stillbirth. It was typical of her attitude in money matters that she could not make up her mind to marry him, though he was earning enough, because she could not bear the thought of losing her public assistance subsidy. Otherwise her sexual life was normal as far as could be ascertained.

When the patient was 13 a severe obsessive-compulsive state occurred for the first time. Her mother read her out a story from the newspaper about a girl who split her mother's head open with an axe so as to obtain possession of her clothes. While listening the patient suddenly thought that she might act in this way to her mother or someone else. She could not suppress that thought however much she tried. When she saw an axe the compulsion to use it was almost irresistible. "I had to take the axe or anything heavy and imagine that I was doing it. I held it for a minute or two behind people's heads as if I was going to use it. I even touched my sister from behind with the axe and told her, 'You know I could not hurt a fly.' I also hit myself on the head, but not hard." The patient does not remember whether that first obsessive-compulsive state was associated with depression. She recovered completely after two months. When she was 18 she had a depressive state of moderate severity lasting for about two months. No precipitating cause could be elicited. That depression "brought back the axe" and the habitual obsessive-compulsive symptoms became more severe. Then, as on the first occasion, the homicidal compulsion disappeared with the resolution of the depression. At the age of 30 she had a similar depression, again associated with the homicidal compulsion. From the age of 35 she had short depressions of the same type, lasting for about two months every alternate year in the autumn or spring. During one of those depressions she was in Jordanburn Hospital, where she recovered after six weeks' stay. The most recent illness was by far the longest. It began in January, 1943. The patient became depressed, hopeless, could not enjoy anything, refused food and wished to die. Once she nearly turned on the gas-tap with suicidal intention, but could not make up her mind and dusted the tap thoroughly instead. As on previous occasions, the depression soon became complicated by a number of obsessive-compulsive symptoms. Apart from her increased obsessional preoccupation with cleanliness, she had a counting compulsion, a compulsion to read and spell words backwards, to group objects of her environment in a certain fashion, etc. During that period of depression a new symptom appeared, i.e. the compulsion of putting breakable things, such as china or clocks, on the edge of the table, balancing them for a time and dropping and catching them. She derived satisfaction from the idea that she could prevent them from breaking. On some occasions, however, she did not catch

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them and they broke, which upset her very considerably. The compulsion of hitting people on the back of their heads had reappeared. The patient said that she felt great satisfaction, as by refraining from hitting she saved the lives of those people. She also combined the balancing trick with the homicidal compulsive ceremonial. She used to balance heavy objects on the tips of her fingers over the heads of her relatives and friends. When one night the man she was living with woke up and found her balancing precariously a heavy flat iron over his head he became alarmed and persuaded her to seek admission to a mental hospital. While in hospital the patient was at first very depressed, and she refrained from carrying out any of her ceremonials for which she always had full insight. The depression improved, and after three months' stay in hospital she was discharged. At home she quickly relapsed, and the obsessive-compulsive symptom associated with the depression prior to admission reappeared. She was readmitted in October, 1944. At the time of the conclusion of this paper she was still in hospital. She was still depressed, but succeeded in suppressing her compulsions, with which she was constantly preoccupied.

It is noteworthy that this patient did not, like most patients of similar type, blame the obsessive-compulsive symptoms for her depression. When asked whether she was depressed because of those ideas she used to say: "I do not know what makes me depressed. I think it is the depression that is making the ideas. When I get bright again then the ideas go."

There never had been any definite hypomanic phases, but sometimes, especially following the recovery from the depressions, she had felt overjoyed and excitable. On several occasions the periods of depression had been heralded in by depressive dreams, in which her habitual compulsions were prominent. She also had dreams in which she was hitting people on their heads with a feeling of pleasure but without the awareness of doing them harm. Such dreams had occurred occasionally during the intervals between the depressions when the patient was free from homicidal compulsion. The patient as well as her sister and her cousin had often experienced feelings of unreality in the intervals between their depressions.

Case 2.—Mrs. E. H—, born 1910. Family history negative. Normal childhood development. The patient had always been very meticulous and over-conscientious. She married at the age of 22. Her husband described her as over-fussy. She used to clean her flat twice a day, and felt compelled to wash the dishes twice after every meal. She had a phobia of breaking things, especially china, and when handling crockery she was always extremely careful. When, on rare occasions, she happened to break things inadvertently, she was unhappy and annoyed for some days. At the age of 23 she had a depressive state of moderate severity lasting about four months. There obviously was nothing unusual in the symptomatology of that condition, which had developed without any known cause. The patient remembered, however, that the obsessive-compulsive symptoms had been very much in the background during that period, but returned when she recovered. When 29 she became depressed again. In addition to the features which she had shown in her first depression there were some new symptoms. She was more restless, felt strong suicidal impulses and once tried to gas herself. She had no insight into the abnormal nature of her depression and of the suicidal impulse. She had, however, full insight into the morbid character of a compulsion, which made its first appearance during that depression and which she constantly tried to fight, namely, the compulsion to break something, especially china. On several occasions she could not help giving way to that compulsion, which was particularly strong at night when she could not sleep and used to wander about in her house restlessly. When in hospital she smashed teacups on two occasions. She denied any other obsessive-compulsive symptoms during that period of depression. She said that she had lost interest in everything and that she did not worry about tidiness. In fact, while in hospital she was rather inclined to neglect herself. She recovered completely from her depression, and on her return home three months after admission she resumed her previous way of living. She was last heard of a few months after discharge. The impulse to break things had disappeared, and otherwise her behaviour was the same as before the depression.

Case 3.—Mrs. J. H—, born 1907. Family history negative. Normal childhood development. The patient had always been quiet and reserved. Ever since puberty she had been extremely meticulous, inclined to make sure and to do things over and over again in an obsessional manner. She married at the age of 20. At the age of 27, following the birth of her fourth child, she was depressed for more than a year. During that period her obsessional symptoms became much worse. Apart from repeating things more often than before she used to wash herself more than twenty times a day and demanded from her husband the same standard of cleanliness. She was very aggressive towards him and the children. After 18 months the depression subsided and the obsessional symptoms were much less prominent, though a certain degree of increased aggressiveness remained. At the age of 31 a similar depressive state developed, again associated with an increase of the obsessional symptoms and the aggressiveness. During that period of depression the patient was in hospital for four months. She exhibited the picture of a depressive state of moderate severity with suicidal ideas and a tendency to self-accusations. She had no insight into the morbid nature of those ideas, but she was fully aware of the senselessness of her excessive cleanliness and of her aggressive attitude towards her husband, which she tried to keep under control. In hospital she succeeded fairly well in suppressing her washing compulsion. She was discharged much improved 18 months after the onset of the

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depression. A few weeks later her condition was the same as before the depression. According to informations received from her relatives two years after discharge from hospital she had had no relapse.

CASE 4.—Mr. P. W. A—, forester, born 1918. Family history: A younger sister was, in 1939, treated in this hospital with schizophrenic symptoms. On re-examination in 1944 she presented the picture of a stationary schizophrenic condition with blunting of affects and paranoid ideas. Otherwise the family history was negative. The patient developed normally, was of a cheerful disposition and a good mixer. Since the age of 16 he had led an active sexual life. He married at 21 and had one child. He had been free from nervous symptoms until at the age of 12 he developed a counting compulsion. Before going to sleep he had to count from one upwards and often spent as much as an hour doing this. He tried to resist the compulsion, but was forced to give way by the fear that otherwise he himself or his relatives might not wake up in the morning. That symptom passed off after a few years. Since adolescence he had often felt the compulsion when reading to go back and read over some sentences again, even if he had fully understood them. That symptom had been present ever since. For many years he had often felt the urge to make sure whether he had turned off the water tap, locked a door, had put out a cigarette end, etc. He often had to repeat those things several times. Those obsessional symptoms were not very persistent and did not interfere with his work. Since the age of 16 he had had marked mood swings. Once or twice a year he would, for a few weeks, feel excitable, overactive, full of joy, would sing for hours, was very talkative and inclined to drink more than usual (habitually he was very temperate). There were other periods lasting for about a week when he would be very quiet and feel dull and unable to enjoy anything. Those mood swings did not interfere with his work, but were pronounced enough to be noticed by his relatives. In 1936 and again in 1937 he was operated on for gastric ulcer. Since then he had been free from gastric symptoms. That illness had not given rise to any abnormal mental reaction.

When he was 16 he became depressed without any known cause. He had an "empty" feeling, felt that life was not worth living, that he was no good and a burden to everybody. He thought of taking his life. During that period obsessional traits become more pronounced and persistent. He was able, though with great effort, to carry on with his work. He recovered suddenly after three months. During that period of depression he had no homicidal or suicidal compulsions. Since then he had been well, except for the mood swings and the slight obsessional traits until April, 1944, when one evening, without any reason, he felt dull and depressed, experienced an "empty" feeling, cried, could not sleep. Together with the symptoms of depression, homicidal and suicidal compulsions appeared for the first time in his life. He had the fear he might murder his wife and child. He could not help indulging in phantasies in which he saw them lying in their blood slain by him. Whenever he saw a knife, an axe or any other heavy object he imagined himself using them to kill wife and child. From the beginning the patient was fully aware of the morbid nature of those thought contents and tried to suppress them. Four weeks after the onset of his symptoms he gave up work and went to his parents. There his condition became worse, and for some days his compulsions extended to his parents and his sister. He never made a suicidal attempt, nor did his homicidal compulsions result in any kind of action. From the beginning the patient experienced very pronounced evening remissions. Every day, when evening approached, the depressions as well as the obsessive-compulsive symptoms faded out completely. He could go out and enjoy himself and each time he felt he had recovered, only to be disappointed by the reappearance of the symptoms in the morning. Throughout his illness he had frequent nightmares from which he woke up in terror. He was unable to give a clear picture of those dreams, in which he felt chased and threatened.

The patient was admitted to the Jordanburn Hospital on 23.v.1944. During the first two weeks he felt slightly improved, though the depression and the obsessional symptoms were still present. In the morning the patient would appear depressed and complain of being tormented by his compulsions, He often cried, and expressed a feeling of hopelessness and fear of insanity. There was no marked retardation, and the patient was able to work in the occupational therapy department. In the evenings he appeared quite normal. Interviews did not reveal any conscious causes for the aggressive thought contents. His marriage had apparently been a complete success and he was devoted to his wife and child. The patient's condition deteriorated after the initial improvement, but the evening remissions were maintained. The patient was inclined to blame his obsessive-compulsive ideas for his depression. However, in the middle of June he declared that those ideas had completely disappeared, but that he was still depressed. For the following two weeks he showed very marked signs of depression, which, according to him, had become more severe since the obsessional symptoms had passed off. Now he could not give any reason for his depression, and he did not feel any relief on account of the disappearance of the homicidal compulsions, though previously he had often said spontaneously that he would certainly be quite well and happy if only those thoughts ceased. When after two weeks following the disappearance of the obsessional symptoms the depression remained unchanged and the patient insisted that he was feeling much worse than before, electric convulsant therapy was instituted. He had a course of six treatments between 28.vi and 14.vii. After the second treatment he woke up with the feeling that he had been knocked down by a lorry and for some days he could not get that idea out of his mind, though he knew that no such accident had happened. It passed off after the third treatment and from then on he improved rapidly.

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After the last treatment he was only mildly depressed in the mornings, and when he was discharged a week later he felt free from symptoms. He was discharged on 22.vii.1944. A week later he resumed work, and he has been free from depression and the accompanying obsessional ideas since. According to himself and his wife he had completely recovered. He was last heard of on 20.xi.1944.

Case 5.—Miss A. W. S—, born 1888. Family history: Mother, who died aged 85, had suffered from a senile psychosis with anxiety and agitation for the last three years of her life. One of the patient's three brothers was described as over-conscientious, and inclined to repeat things in an obsessional manner. A maternal cousin had a depressive state in his twenties. The patient was a normal child, always cheerful and sociable. The home life was happy. From adolescence she had been in the habit of making sure whether she had turned off the gas or water tap, locked the door, etc. She used to go back several times to make sure. She also had a fear of coming into contact with poison and doing harm to other people, never to herself, by transmitting the poison on to them. Her fear was confined to substances labelled as poisons. That phobia resulted in a moderate washing compulsion. All those obsessional symptoms were of a mild degree. At the age of 24 the patient became depressed without known cause. She thought that by masturbating she had done wrong morally and ruined her life. She blamed herself severely, though previously she had masturbated without undue sense of guilt. During the period of depression the obsessional fear of poisoning people and the washing compulsion became much worse. After four months the depression and the self-accusations passed off spontaneously, and the obsessional symptoms returned to their previous moderate degree. In 1930, six months after her mother's death, the patient had another period during which the obsessional symptoms became much worse. She was again depressed, and the self-accusations about masturbation reappeared. She feared that every movement of any part of her body was an attempt at or a substitute for masturbation, and she would sit for many hours without daring to move. During that period she developed for the first time the fear she might hit or choke children when passing them in the street. She tortured herself with doubts whether she had not choked her mother when nursing her. She again recovered after four months, and from that time until 1944 her condition had been the same as prior to the depressions. In April, 1944, she again became depressed without any known cause. She complained about a wooden feeling in her head. She could not take interest in anything and felt that life was not worth living. She again blamed herself for having masturbated. Two weeks after the depression set in the habitual obsessional symptoms increased in severity, and they were in the foreground of the clinical picture when the patient was admitted to the Jordanburn Hospital four weeks after the onset of the depression. In hospital she asked constantly for an assurance that she had not been in the surgery, where she thought dangerous drugs were kept, and that she could not possibly do harm to other patients by having touched those poisons. Soon after the increase of the habitual phobia the self-accusations about masturbation faded out. This time, like twelve years ago, the fear of doing harm to children appeared. The patient did not dare to leave her bed unaccompanied. As on previous occasions, she blamed masturbation for her symptoms. Though the patient complained about depression and loss of interest, there was no retardation of the stream of thoughts and she often smiled about her fears and compulsions, which she regarded as irrational and tried to suppress. There were occasional evening remissions, during which her symptoms were much less marked. A course of electric shock treatment resulted in a marked improvement of all symptoms. At the time of the conclusion of this paper the patient was still in hospital.

Case 6.—Mrs. H. F—, born 1910. Family history negative. In childhood the patient was afraid of the dark. She lost that fear in adolescence. However, she never lost the fear of dogs and cats, which also developed in childhood. She would avoid going out when she saw a dog or cat outside her house, and she would make a detour when seeing such an animal in the street. She could not recall any traumatic incident to which that fear could be related. On leaving school she took up work at a hosiery factory. At the age of 21 she became over-anxious about her work. She felt compelled to look at every piece she had completed over and over again to make sure that it was perfect. She tried in vain to resist that habit. At the age of 25 she developed the tendency to make sure whether she had turned off the gas or water tap, whether she had locked the door, etc., and had to repeat those actions several times to make sure. At 28 she was present when, in the house of a friend, an oil stove caught fire. Since then she had had a phobia of causing fires by cigarette ends and matches. She had to look for some time at every used match to make sure that it was really burned out, and she avoided putting inflammable things away in drawers and cupboards for fear of spontaneous combustion. In spite of those obsessional preoccupations she was quite happy and cheerful until autumn, 1942, when without any known cause she became depressed, listless, cried for hours and took very little food. About two weeks following the onset of the depression she suddenly remembered that at the age of 16 she had once incidentally touched a baby's penis when playing with him. That boy turned out to be a mental defective and was living in an institution. His mother, too, was mental defective, and so was one of his uncles. When the patient recalled that incident it also occurred to her that when she was 23 she had overheard a remark that irritation of the private parts of a baby may make it mentally defective. That remark had not impressed her at the

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time. She rather thought that it was nonsense. However, now it suddenly occurred to her that she might have caused the boy's mental deficiency by having touched his penis. Though she tried to persuade herself that the idea was absurd she could not help blaming herself incessantly. She even wondered whether she had not indirectly caused the mental deficiency of the boy's mother, who might have fallen ill by worrying about her son. In addition, she developed the tendency for blaming herself for other people's misfortunes and illnesses. "If I hear of anybody being killed or ill I wonder whether I had not something to do with it. I seem to blame myself. I don't want to hear anybody complaining, as I fear I might blame myself for it. At the same time, I tell myself it is nonsense." The patient did not always attempt to suppress those ideas and the self-accusations as nonsensical. At times she did not take up a critical attitude towards them, but the element of doubt was never completely lacking even when she was overwhelmed by guilt feelings. With the onset of those ideas the fear of causing fires became worse. She used to stand in front of her fireplace for a long time to see whether it was safe, and could tear herself away only after having counted slowly from 1 to 7. The patient was inclined to blame her obsessional ideas for her depression, although the latter had set in a short time previously. That condition lasted for six months. According to the patient it subsided because she had quite definitely realized the absurdity of her fears. For the following 18 months her condition was the same as prior to the depression. In April, 1944, she relapsed into a state of depression with exactly the same thought contents as the previous one. This time the onset of the depression did not precede the emergence of the obsessional ideas with self-accusations and the increase of the habitual phobias, but all symptoms appeared together. The patient was admitted to the Jordanburn Hospital on 4.v.1944. She presented the picture of a moderate depression without retardation. She would often cry, but she was fairly sociable and often appeared quite cheerful, though she was continuously preoccupied with her depressive and obsessional thoughts. There were no evening remissions. During July, 1944, the patient had a course of electric shock therapy (six treatments) without effect. At the beginning of September her condition began to improve. The thoughts were not as overpowering and persistent as they had been during the previous months. The patient was discharged much improved in September, 1944.

CASE 7.—Mr. L. A. R—, schoolmaster, born 1896. Family history: Father was an alcoholic, of an aggressive temperament and inclined to be paranoid. Mother had been a patient in this hospital at the age of 49, when the patient was in his tenth year. She had the delusion of being responsible for all the insanity of the world. She also had ideas of persecution and visual and auditory hallucinations. She was extremely agitated and depressed. She was discharged recovered after 14 months and had no relapse. She died from heart failure, aged 70. One of her sisters had a very similar condition, for which she was treated in this hospital for six months. She had ideas of unworthiness and visual and auditory hallucinations. She imagined herself being charged with electricity, and thought that armed men were standing round her bed. She was discharged recovered and had no relapse. In both cases the diagnosis was involutional melancholia. Personal history: The patient was the only son. He had always been very timid and inclined to keep to himself. Ever since puberty he had been hypochondriacal and preoccupied with his motions. Even when middle-aged he thought that a healthy person should have a motion after every meal. At his work he was extremely conscientious and meticulous. Early in adult life overt obsessive-compulsive symptoms (washing compulsion, phobia about water-taps) developed. Books had a great fascination for him; he felt compelled to smell every page and to blow his nose when turning a leaf. He was always aware of the senselessness of his compulsions and tried to resist them. In spite of those handicaps he made a success as a history master, though it had always been a great disappointment to him that he failed to obtain a university appointment. Sexual history: Even before his sixth year he had been conscious of sexual feelings, which occurred first when he was whipped by his mother. Since childhood he had had sadistic and masochistic fantasies associated with the anal region. One of the reasons why he did not like the idea of becoming a school teacher was the realization that the infliction of physical punishment caused him sexual pleasure. Since early adult life female knickers had been a subject of masturbatory fantasy. He used to buy them for the purpose and described them as his "fetish." Those fantasies had always been associated with a strong sense of guilt. The patient married at the age of 36. There had been normal sexual activity only during the first year of his married life. Since then he had felt no desire for intercourse, but he continued with masturbation.

The illness which resulted in his admission to the mental hospital set in gradually at the age of 47. The patient became depressed and agitated, and expressed ideas of reference. He thought that he had been responsible for the appearance of enemy raiders over a town a hundred miles away by not having blacked out his house carefully. He threatened suicide. He blamed himself for not having looked after his relatives. He called his wife an agent of God and expressed religious ideas, having been very anti-religious before. On admission he was in a state of anxiety and depression. He replied to questions in great detail, indulging in extremely long sentences. He expressed self-accusations about his sexual life. He thought that sounds were made on purpose for his discomfort; various bangs were due to the construction of a scaffold destined for his execution. He heard school children calling him names. He thought that microphones were hidden in his room, and that people were trying to trap him to make him out to be in league with Germany. They were misconstruing his professional interest in German

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history as proof of his treachery. They also had suggested that he was suffering from syphilis. He expected severe punishment, such as castration or immolation. However, at times he would express doubts regarding the validity of his ideas, and say they were all imaginary and absurd. Ten days after admission the patient lapsed into a stuporose state. He lay in bed motionless and resisted attempts to change his position. Occasionally he made a remark of an unintelligible nature, talking about the " real truth " and quoting verses from a Norse saga. On other occasions he would hint that he was to be sacrificed and that he was a Beserker Viking (his father had taken a great interest in Norse sagas). One day he was seen standing in the ward erect, motionless, with his arms by his side like a penguin. For some weeks he was completely mute and had to be spoon-fed. The catatonic state, during which he appeared profoundly distressed, lasted two months, after which the patient's condition was similar to that on admission. He made a serious attempt at hanging himself. Four months after admission the patient was subjected to a course of six electric shock treatments, following which he improved considerably. Though remaining depressed, he had complete insight into the morbid character of his symptoms prior to treatment. He revealed that during the periods of stupor he had imagined himself being in a Nazi concentration camp, where he had been subjected to the most cruel tortures. He had felt that by not moving and by taking up certain positions he was more likely to survive. All the time he had been most distressed and had felt that he deserved punishment. Four weeks after the conclusion of the shock treatment the patient again heard voices and expressed ideas of reference and persecution, as well as self-accusations. As before, he often showed remarkable insight and considered the possibility that his ideas might be signs of illness. He was prepared to rationalize upon those phenomena and to offer psychological explanations, such as " My desire for punishment may be due to my masochistic tendencies." Another course of shock treatment again resulted in considerable improvement with full insight, though there still remained a certain degree of depression for some time. During the whole course of his illness obsessive compulsive symptoms were absent. The patient was discharged recovered nine months after admission. At the time of the completion of this paper he was still keeping well, though the habitual obsessional symptoms had reappeared.

Case 8.—Mr. M. T—, farmer, born 1922. Family history: Both the paternal and maternal grandmothers were described as nervous and inclined to depressions. The patient's father was a rigid personality; he was over-religious and had various superstitious taboos. The mother was described as normal and highly intelligent. The patient was the only child. He developed normally and had a good school record. He was brought up very strictly, and was greatly influenced by the religious atmosphere of the parental home; long before puberty he expressed the desire to go into the ministry. He was very much attached to his mother, while he was afraid of his father. Perhaps all his life, but certainly from his sixth year, he had been beset with obsessive-compulsive thoughts. He had always to make sure whether he had done a thing correctly. He had constantly to fight sadistic thoughts, and he had always had to cancel an evil thought with a good one or by carrying out some magic gestures, such as touching objects, especially wooden ones, according to certain ceremonials. He was always afraid of injuring people, especially his parents. He would have to enter a room with a certain foot first. Having done a thing he would have to repeat it with good intention or some ill-luck to him or others bound up with the first action would result. He was aware of the senselessness of those activities and constantly tried to resist. When as a boy of 14 he had to bury a dead sheep at the farm this seemed to him symbolical and to presage similar treatment of some human being; he had to dig it up and re-bury it to arrest this. After adolescence he began to doubt the dogmas of his Church. He had obsessional thoughts of a blasphemous nature. At that time his sadistic compulsions became stronger, involving cruelty to children and old people and a mutilation of corpses. He also felt the temptation to become a " slasher," i.e. to attack women with razors. He rejected those thoughts perpetually, but they were with him all the time and even followed him into his dreams. They were only rarely associated with conscious sexual excitement, but even so they gave him a feeling of sinister pleasure. He described his resistance against them as " like holding a door against a flood."

Sexual life: When he was 15 he first felt attracted to girls, but after having suffered several rebuffs he kept away from them. He had masturbated since adolescence without a sense of guilt. Only recently his masturbation fantasies and his sexual dreams have become associated with ideas of mutilation and murder. In his sexual fantasies he often had intercourse with his mother. For many years human and animal excrements had had a peculiar fascination for him, and he had felt attracted and repelled by them at the same time.

In spite of his constant struggle against his obsessive-compulsive thoughts he did well at school and was of a cheerful disposition. He made plenty of friends. When he was 15 his father, a keen hereditary farmer, took him away from school to farming. Despite his farm work the patient continued to study Latin and to take correspondence classes.

A noticeable change in the patient's behaviour set in when he was 18. While he had been meticulously clean and tidy during childhood and adolescence, he now began to negelct his appearance. His sleep was disturbed, and at night he could often be heard groaning and shouting. He expressed suicidal intentions, and said he would do away with himself if he only knew what was after death. While he had been an affectionate son until then, he now ill-treated and abused his mother without provocation, but he got on fairly well with his father and readily

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confided his difficulties to an aunt. His behaviour at home became unbearable, and at the age of 21 he was admitted to hospital.

On admission the patient, a healthy-looking man, was in a state of considerable tension. At night he was extremely restless and agitated. He threw himself against the wall and had to be put under restraint. In spite of this he continued to upset the bed on top of himself and tried to wriggle through the padding placed between himself and the wall. Sometimes during those periods of agitation he would weep and say, " I cannot go on." On other occasions he would smile in a mischievous way. During the daytime he was quieter, although often he roamed about restlessly in the ward. He refused to be shaved and to tidy himself, resisted interference and once bit the attendant. When interviewed he answered questions promptly and intelligently, and gave an account of his symptoms with remarkable clarity and insight. He explained his restlessness by saying that he was constantly upset by noises, especially at night. Those noises, though of a trivial nature, interfered with his obsessional thoughts, so that he had always to go back and start thinking afresh and cancelling evil thoughts. For the same reason he resented interference on the part of the attendants. He was well aware of the irrational nature of his behaviour. He never regarded his obsessive-compulsive ideas as being of extraneous origin. In describing his symptoms his affect was not quite appropriate. During the last two years he had been feeling deliberately crossed and his ambitions thwarted. If he wanted to get away punctually from his farm work a cow might seem to annoy him by causing him extra trouble. Similarly, if he were trying to read a dog would bark consistently. The animals may be an incarnation of someone. He had hit cows for interfering with his train of thought, and in one of those outbursts he had blinded a cow. Afterwards he had always been ashamed of himself and often doubted the justification of his suspicions. He often had the impression that people were talking about him. There had for some time been " a conspiracy, a coalition of forces against him at work " with the aim of making life impossible for him. He did not, however, attribute that conspiracy to any particular source. He sometimes would admit that those ideas were ridiculous, but he felt that there was something in it. " This won't stand cold logic but I feel it, though it may be a delusion." In addition to those ideas he had developed a peculiar notion about women in general. They were the source of all the evil in the world. In his diary he wrote, " Women rule the world. They influence men. One woman will not escape my clutches—slashing—I want to make them suffer. One woman will be dragged down by me. One woman will be haunted and shadowed. Some day, somewhere I shall see her buried. I shall trample with triumph on her grave. I shall spit on it and gloat over it. I would curse them with my dying breath. We are the victims. Women are not satisfied with having the poor man groaning, screaming in agony, rolling in the mud, etc." He had been collecting evidence for the correctness of his views for some time. A debate in parliament about equal pay for women made him furious. When asked about his behaviour towards his mother he said : " I dislike her because she is a woman. I don't know whether she is a human being. I would slash her if I did not get caught. I take a pleasure in the decline of her beauty and health. Once she has lost beauty and health she cannot torment men." However, he always felt sorry and ashamed of himself after an outburst of aggressive behaviour, and he always asked his mother under tears to forgive him.

The patient's behaviour in hospital improved gradually, though he continued to be in a state of constant tension. He said that he was becoming more careless in cancelling his evil thoughts. He distinguished between his genuine " evil thoughts," i.e. those he could cancel by counter-thought or symbolic actions, such as touching objects, and the " dangerous involuntary ones," i.e. those thoughts which overcame him and could not be cancelled but had to be suppressed with great effort. To the latter group belonged the impulses to make others suffer.

After a quiet period lasting two weeks the patient relapsed into the condition of agitation and resistiveness. He was found to have secreted a table knife in his bed and admitted that he had done this under the impulse to slash somebody. Following a night of wild agitation, he stated that a particular thought troubling him at the time had to do with rape on the maggoty corpse of his grandmother, and he exclaimed in despair, " What would you do if you were alone in a graveyard and saw all the rotting dead looking out of their coffins and you were revelling in it ? " During the following weeks his behaviour improved considerably. There were no further bouts of agitation, and four months after admission the patient was discharged. He took a job as an assistant proof reader in a newspaper office. He found the work difficult, complained of inability to concentrate, of a compulsion to read words many times, and of his constant struggle against sadistic ideas, which took him a great effort to cancel. However, his behaviour at work gave no cause for complaints and the quality of his work seems to have been satisfactory. His conduct at home had not changed. He treated his mother as he had done before. New obsessions made their appearance; for instance, the idea that when crossing a line walking in the street he was crossing somebody's line of life. His notions about the female sex and the conspiracy against him remained unchanged, but he was always prepared to admit that it was all very unreasonable. Once he spontaneously declared, " Maybe it is a theory that I have built up as a pretext. The ideas about women may be a reaction to personal disappointments." Two months after discharge from hospital his behaviour towards his mother improved very considerably, perhaps as a result of the psychotherapy he received. He was kind and affectionate, as he had been before his deterioration. However, a month later he declared that he could not carry on with his work as he could not stem the flood of his thoughts and impulses,

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which kept him awake all night. He expressed the desire for readmission, and he was taken into hospital three months after his discharge. There he behaved well and was co-operative. Though speaking less about his ideas regarding women he had not given them up, but often expressed doubts about their validity. His constant struggle against his obsessional thoughts and the power which his impulses and delusions still had over him was borne out by his diary, in which were found two pictures of young women, one the photograph of a girl he had known some years before, and the other a cutting from an advertisement picturing a young woman. In the photograph he had drawn a black hand holding a dagger against the neck of the girl, while in the other picture a black hand had run the dagger deep into the back of the chest, blood dripping down, and the words " Revenge is sweet " written under the picture. He also admitted that some time age he almost had left his house at night armed with a knife with the intention to kill a certain girl of his acquaintance. Two weeks after readmission the patient attempted suicide by trying to cut his throat with the buckle of his belt. A course of electric shock treatment resulted only in slight improvement. The patient said that after treatment he found it easier to cope with his obsessive-compulsive symptoms. He was less tense and more manageable, but the contents of thought remained unchanged. Frontal leucotomy is being considered in this case.

Case 9.—Mrs. E. H—, born 1891. Father had suffered from " religious mania," a maternal aunt from melancholia. The patient had had obsessive-compulsive symptoms (bacillo-phobia with washing compulsions, ruminations) since the age of 20. She had been particularly afraid of earthworms and of excrements of dogs. In spite of those symptoms, which showed no tendency to remissions, the patient was able to earn her living as a clerkess until she married, at the age of 27. Her symptoms remained unchanged, but otherwise her behaviour was normal. At 34 she complained about blasphemous ideas which she tried in vain to suppress. She began to take an increasing interest in religion. Four years later she heard the voice of Christ and was often found in states of religious ecstasy. She became aggressive against her husband and threatened him with murder. On one occasion, at the age of 39, she attempted suicide. She could be kept at home until, at the age of 44, she went out with a cross in her hand and ate animal excrements, earthworms and dead flies, which she picked up in the street. On admission to hospital she declared that she wanted to glorify God by humiliating herself. The idea of eating dirt had occurred to her suddenly when she thought of making a sacrifice. At first she had resisted the impulse; after hours of struggle she decided to do it, but once only. Then, to punish herself for her hesitation, she had forced herself to do it fourteen times, thinking of Calvary. She said that St. Francis had done similar things and so had a French saint, who, as an act of atonement, had drunk from the urine of a man she nursed. The patient was proud that she, like those saints, had in the service of God overcome the resistance against doing things which she had always abhorred most. In hospital she had on many occasions to be prevented from eating faeces, drinking urine and licking the floor. She said that she heard voices demanding those sacrifices. Eight weeks after admission her behaviour improved. She felt no further coprophagic desire, and expressed disappointment that the miracle for which she had been waiting as a reward for her sacrifices had not materialized. From that time she was quiet and working steadily. Occasionally she heard voices, but her behaviour was normal; there was no thought disorder. As her husband refused to take her home she had to remain in hospital. Her phobias of animals' excrements and dirt had reappeared.

Case 10.—Mrs. K. J—, aged 49, was admitted to a mental hospital in a severe state of agitation, in which she had injured herself by running her head against the wall. Family history: One of the five children of the patient died in a mental hospital in Paris in an acute delirious condition. Otherwise the family history was negative. Personal history: As a child the patient was of normal intelligence, but showed some peculiar features. She liked to sit for hours in her father's shop counting coins. Even as a child she was fanatically clean—a peculiarity which she preserved all her life. She used to tyrannize her family with her fervour for cleanliness; did not allow them to enter the living-room unless they had carefully washed their hands. Since puberty she had had a washing compulsion. One of the most outstanding personality features was her meanness in financial matters. She was morose and given to brooding. When she was 42 her husband died. At about the same time the patient began to behave in an abnormal manner and to express strange ideas. She complained that people were watching her and she expressed fear of being poisoned. She became over-religious. At the age of 44 she was treated in a mental hospital for one month. After her discharge from hospital she was much better, though she still expressed ideas of reference on occasions. She looked after her household until, at the age of 49, the state of agitation mentioned above occurred. On admission to hospital she declared she had felt that she had to inflict injuries on herself to atone for her sins. For the same purpose she also had drunk dishwater and eaten human faeces. Having thus humiliated herself she felt much better. She said that she had heard the voice of her dead son ordering her to perform those acts of self-humiliation, and to go on doing things which she had always felt to be extremely distasteful. She said she had felt an urge to eat excrement; while in hospital she had to be prevented from doing this, and on several occasions she was found licking the floor soiling herself with dust and attempting to drink dishwater. At times she said that she was insane, but that she had to continue eating dirt and soiling herself until the last traces of insanity

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had passed off. After two weeks she abruptly stopped her abnormal behaviour, and declared that the desire to eat dirt had gone and that she would not do it again. She said it was most improper and utterly senseless. She did not hear her son's voice any longer, but she denied the possibility of having imagined it, and insisted that her son had ordered her to do those things to harden herself and to atone for her sins. For a few weeks before she had received those orders through her dead son she had been even more anxious to keep clean than ever before. She had washed her whole body with spirit five to six times a day, and had suffered from extreme fear of contaminating herself with faeces in the lavatory. Then she had thought her fears and compulsions to be morbid and had tried in vain to fight them, until on Divine order she had in a miraculous way been able to overcome her life-long fears and disgust.

The patient was kept in hospital for a few further weeks, during which she behaved normally and showed herself excessively clean. She lacked insight in the abnormality of the conduct which had necessitated her admission. She was discharged home. According to her relatives she returned to her previous habits of excessive cleanliness and her washing compulsion reappeared. Occasionally she expressed vague ideas of reference. This condition had remained unchanged when the patient was last heard of two years after discharge from hospital.

CASE 11.—Mrs. F. K—, born 1895, had always been extremely orderly, excessively clean and economical. She was very strict with her children and very religious. One outstanding feature was her excessive sense of shame. She missed no opportunity to condemn public baths and modern fashions as utterly improper. She volunteered the information that her husband had never seen her undressed during 20 years of married life. That attitude was of interest in view of her conduct during a psychotic episode at the age of 44. She showed the first signs of mental abnormality at the age of 42, when she intensified her religious activities. She was under the compulsion to say a prayer for everybody she knew. She was constantly afraid of forgetting one of her friends or acquaintances, and this fear made her repeat her prayers over and over again. She regarded her behaviour as senseless and tried in vain to fight it. At the same time she became even more pedantic than she had been before. At the age of 44, on a cold winter day, she left her house completely naked, walked about in the street for some minutes and returned home. She was taken to a mental hospital. On admission she was quiet and fully orientated. She explained that she had suddenly become aware that by praying excessively she had reached a higher moral level than the Holy Trinity. She had seen visions in which she had stood higher than the Holy Trinity. This was an offence against Divine law. She had to humiliate herself to make good for that sin, and only by disgracing herself could she earn forgiveness; to effect this purpose she had to show herself naked in public. She had to overcome a strong resistance against going out in the street naked, and three times she returned before she could do it. When at last she had overcome her inhibition and had been seen by two men in the street she returned with a feeling of deep gratification. While in hospital the patient was quiet and co-operative. She had no insight into the morbid nature of her conduct that had led to her admission. She expressed vague paranoid ideas. She was discharged after three weeks. Soon after her return home she resumed her excessive prayers. Three weeks later she again saw visions for a short time. She was admitted to another mental hospital, where she remained quiet and co-operative.

CASE 12.—Mrs. S. P—, born 1885. Family history: Mother irritable, suspicious; father unstable, happy-go-lucky type. The patient had four brothers. The eldest, seven years older than the patient, showed typical obsessional traits since childhood; he was extremely pedantic, always had to make sure, was given to ruminating. The second brother, five years younger than the patient, showed similar traits. The third brother had always been extremely pedantic and parsimonious, though not showing overt symptoms. The fourth brother, two years younger than the patient, had, from childhood, been suffering from a washing compulsion and phobias of gas and water.

The patient herself had been suffering from obsessive-ruminative symptoms ever since childhood. She had always been very pedantic and excessively clean. Since puberty she had had a washing compulsion. She used to ruminate over trivial questions for hours. However, she was cheerful and sociable. She married in 1910. The tendency to rumination and the washing compulsion remained unchanged. She often would have to discontinue work for some time in order to "think a certain thought through." In 1914, when she was 29, she voluntarily entered a mental hospital for treatment of her obsessive-compulsive symptoms, which had at that time become more severe. In addition to the old symptoms a compulsion to accompany the ticking of the clock with a certain word had appeared. The diagnosis on admission was obsessional neurosis. However, after two months the patient became agitated and expressed numerous delusions. She said that the chief of the hospital was the King, the matron the Queen, and her husband the heir to the throne. She spoke a good deal about Mary Stuart, with whom she identified herself at times. She felt influenced by hypnosis, and heard voices telling her that she was a descendant of God. Her mood was usually one of elation. At times she showed no sense of shame and for some months her speech was quite incoherent. Her condition was regarded as one of paranoid schizophrenia. About a year after admission the patient gradually improved and she was discharged from hospital, though she still expressed delusions and was slightly hallucinated. Within a few months of discharge those symptoms disappeared, but

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now the obsessive-compulsive symptoms, which had been completely absent during the psychotic period, reappeared. The patient had full insight into their morbid nature and tried to resist them. When she was 35 there was a short period lasting for about two months when she again felt influenced by hypnosis and occasionally heard voices. Apart from this episode her condition was the same as before 1914, though the psychotic period had left behind a degree of emotional flattening, and the patient, who had been very sociable before, tended to keep to herself. At the beginning of 1935 she again began to hear voices and her habitual obsessive-compulsive symptoms disappeared. In April of that year she was readmitted to hospital, where a condition very similar to that of 1914–15 developed. Her delusions and hallucinations showed the same contents as during the first psychotic period. When asked about her previous obsessional symptoms she declared, in a mood of elation, " Now I'm free. I am my own mistress. I can think as much and as far and as fast as I like. Before I could never think anything to the end." The patient's behaviour showed considerable fluctuations. At times she was quiet and well-behaved for a week, and during such periods she would express doubts in the reality of her delusions and hallucinations. Seven months after readmission she was discharged from hospital as recovered. She was free from hallucinations and delusions, but her obsessive-compulsive symptoms had reappeared. Since then her condition has remained unchanged. She was last heard of three years after discharge.

The following two cases were not investigated by the writer. They were found among the case-records of the Jordanburn Hospital. The records of these cases, which had not been written *ad hoc*, are somewhat incomplete, but they are sufficient for the purpose of this presentation. They represent a type of " borderline " case in which obsessive-compulsive symptoms occur prior to and alongside with stereotyped actions and mannerisms of a schizophrenic nature without advanced regression.

Case 13.—Mr. C. M—, farmer, born 1913. Family history negative. The patient was a normal child and mixed easily with others. When he was 10 he developed a compulsive habit of pulling up his socks, and shortly afterwards he developed a compulsion to touch the door knob frequently. He used to rush at things to get them finished in order to overcome his dilatory tendencies. He tried to resist those habits, which he regarded as senseless. He also experienced great difficulty and diffidence about using the school lavatories, particularly if anybody was near. He was never sure whether he had shut gates properly, and he had to go back several times and reassure himself. Those features had become worse during the year preceding his admission. Sometimes he would perform extravagant bodily movements which had nothing to do with his work. He could not give the reasons for those movements, which he regarded as senseless, but he felt that they helped him to accomplish what he was doing more perfectly than otherwise. When 20 he was seen by a psychiatrist, who thought the case might be an obsessional neurosis or possibly an early schizophrenia and advised hospital treatment. In hospital patient was in a state of tension, though friendly and co-operative. He was manneristic, and not infrequently a facial grimace was seen. There was no gross formal disorder of thought, but there was tendency to irrelevancy and over-talkativeness. He felt compelled to touch things, and he explained that by doing this he was making up for not doing things right. He realized that his obsessive thoughts and compulsive acts were senseless and he tried to resist them. No delusions or hallucinations could be elicited. There was emotional blunting, and his attitude towards his illness was somewhat superficial. His behaviour gave rise to difficulties on several occasions. He cracked three window panes with his head, and explained that he was merely trying to touch the window with his head and had done so too violently. At the table he was very greedy and acquisitive, eating enormous quantities of food and stealing food from the plates of those seated next to him. It did not upset him in the least when he was relegated to a table by himself. The patient was discharged after two months. In the case summary the opinion was expressed that the obsessive acts occurred against a background which was schizophrenic. The patient was not seen again, but a communication from his father, with whom he was living, revealed that he was much improved after discharge, but some months later he became restless and aggressive, broke window-panes and had to be admitted to a mental hospital, where he stayed for a few months. The diagnosis was schizophrenic reaction type. Since then, i.e. for 9½ years, he had been quite well, had been an excellent worker, took part in sports and had joined the local Home Guard. According to his father no signs of abnormality were noticeable. Owing to the impossibility of arranging an interview with the patient, it could not be ascertained whether obsessive-compulsive symptoms were still present.

Case 14.—Mr. A. N—, labourer, born 1908. Father killed in the last war. Mother had symptoms of conversion hysteria. A sister was an imbecile. The patient was a normal child. He always used to keep to himself. In his school work he was solid and reliable, though slow. He was over-conscientious and very meticulous at his work. He worried about constipation. There had been no overt obsessive-compulsive symptoms until, at the age of 32, ruminations set in. On anything that cropped up he had to " think right down until he was sure to understand it " ; but he always doubted that he did, and this feeling made him go back in his thoughts over and over again. He described that habit, which he regarded as senseless and tried to resist

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as "thinking strain." Some weeks later he complained that the people with whom he was working tried to dominate him. They were looking at him and talking about him. He became very irritable and aggressive, which was at variance with his previous conduct. A few days before admission to hospital he declared that he would not allow anybody in the house to drink strong tea, as this was dangerous for their nerves. He was restless, always on the move, and had a strange habit of dancing on his toes. He was admitted a few weeks after the onset of his symptoms. In hospital he was somewhat restless, though co-operative. He was inclined to doubt the validity of the ideas he had expressed, and spontaneously said that he had imagined things and provoked rows about "imaginary grievances." A short time prior to the onset of the symptoms he had started going with a girl for the first time in his life and that may have upset him, though the relationship had been quite happy. He denied hearing voices, though his behaviour sometimes suggested that he was hallucinated. At times he seemed depressed, at times he was bright. He said that he was still checking up on his thoughts, but that he could control his ruminations much better than before. He was discharged improved five weeks after admission. The patient has not been seen since, but it was possible to obtain information about his progress from his mother four years after his discharge. According to her he had returned to his normal behaviour a few weeks after his discharge from hospital. Ever since that time he had been working steadily, though he was still very reserved and at times seemed to be given to brooding. He had married a year after he had been in hospital and the marriage had been a complete success. He had two children.

Case-Summaries and Comment.

Diagnostically the 14 cases presented fall into two groups as far as the psychotic reactions are concerned. Group A (Cases 1 to 4) comprises depressive states. Group B (Cases 8 to 14) consists of cases with schizophrenic (including paranoid) reaction types. The hebephrenic and catatonic reaction types were not represented in this case-material.

Group A.—Case 1 was a patient with recurrent depressions, the last of which, occurring in the involutional period of life, did not clear up like the previous ones. This patient had had an obsessional neurosis from childhood. In her depressions the habitual obsessions were more prominent and new obsessive-compulsive symptoms developed. The depression could not be regarded as secondary to those symptoms. In fact, the onset of the depressions was preceded by exacerbation of the habitual obsessive-compulsive symptoms and the appearance of new ones. The homicidal compulsion during the depression was peculiar in that the aggressive tendencies were much less subjected to secondary elaborations, such as displacement, symbolization and sublimation, than is the case in the typical obsessional neurosis. The compulsions during the periods of depression came precariously near to real actions. However, the homicidal compulsive act taken as a whole showed all the features of an obsessional ceremonial. It contained both the killing and the life-saving motives, thus exhibiting the obsessional ambivalence, which also was quite obvious in the breaking ceremonial in which the breakable objects seemed to symbolize human beings. Possibly the counting compulsion and the compulsion to spell (i.e. taking words to pieces ?) presented further stages of a symbolic elaboration of a destructive impulse. It is noteworthy that in this case the suicidal tendency was comparatively much weaker than the homicidal. The tendencies underlying the compulsive acts during the depression were obviously the same, which in the intervals made the patient over-concerned with conserving and protecting the integrity of living objects and breakables. Then the well-known mechanism of over-compensation was successfully at work. That mechanism failed during the depression when the ego had to be satisfied with just preventing the unruly sadistic impulses from unrestricted licence. Thus it remained master of the situation, though not without making heavy concessions to the destructive tendencies, which in the periods of depression became much more urgent. The constellation under which the homicidal compulsion appeared first suggests that the sadistic impulses were linked with the complexes centred round the child-mother relationship.

Case 2 had, during spells of depressive illness, a compulsion to break crockery, and in this case, too, the compulsion corresponded to a previous phobia of breaking, which was a manifestation of a chronic obsessional neurosis. In this case, however, the neurotic symptoms decreased during the depressive spells.

In Case 3 those symptoms which had been of mild degree previously were exaggerated during the depression, which was characterized by increased aggres-

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siveness towards her family. While in Cases 2 and 3 during the depression the aggressive tendencies against external objects did not take the form of undisguised homicidal compulsions as in Case 1, the tendency to self-destruction was more marked than in the latter case.

Case 4 had had obsessional symptoms since adolescence. He was subject to cyclothymic mood swings, during which the obsessional symptoms showed no change. He had two periods of marked depression. During the first the habitual obsessions became more pronounced, while during the second, in addition, homicidal and suicidal compulsions developed. During the very marked evening remissions both the depressive mood and the obsessive-compulsive symptoms were absent. The homicidal compulsions, the emergence of which had coincided with the onset of the depression, passed off before the depression, which even increased for a short time following the subsidence of the compulsions.

Case 5 had, from adolescence, been suffering from an obsessional neurosis of moderate degree. The most outstanding symptom was a fear of poisoning people by carelessness. In her twenties she had a typical depressive state, with self-accusations about masturbation. During that period the habitual obsessions increased. She had a similar period 18 years later. During that depression there was, in addition to the typical self-accusations, a phobia of masturbating with the tendency to obsessional precautions. Furthermore, an obsessional fear of committing aggressive acts against children appeared, and also the fear she may have murdered her mother. All those symptoms passed off with the depression. Fourteen years later the whole syndrome recurred. The most remarkable feature in this case was the way in which past sexual misdeeds, for which the patient blamed herself in the depression, were associated with a phobia of committing the same offences and with obsessional precautions against them. The idea of possibly having murdered her mother was a self-accusation associated with obsessional doubt. It can be regarded as a phobia projected in the past. In this case, as in Case 4, the evening remissions resulted in a decrease of both the depression and the obsessions.

In Case 6 symptoms of an obsessional neurosis had been present since childhood. At the age of 32 a depression set in, which very soon became associated with an increase of the habitual obsessions and a fear of possibly having harmed others in the past. That idea can be regarded as a self-accusation, subjected to obsessional doubts or a phobia projected into the past similar to that in Case 5. The degree of insight into the absurdity of the thought contents varied. It is noteworthy that in this case the self-accusations tended to spread in the same fashion as obsessional ideas. The patient's attitude towards the self-accusations was similar to the attitude of the obsessional to his compulsions. In fact there was a tendency to taking precautions against self-accusations in an obsessional manner.

In Case 7 the long-standing obsessional neurosis was characterized by the struggle against conscious sado-masochistic impulses. During the severe involutional depression no overt obsessive-compulsive symptoms were present. The depressive psychosis showed a number of features which could be classed as schizophrenic though, as far as the contents of thought were concerned, they could readily be related to the overwhelming sense of guilt and the desire for punishment. The frequent emergence of doubt in the reality of the delusional experiences and the adoption of a critical attitude towards them was again remarkable.

GROUP B.—Case 8 had, since childhood, a severe obsessional neurosis with predominantly sadistic compulsions and a tendency to magic ceremonials. The change in the patient's behaviour which made him unfit for work and dangerous was due to the development of a paranoid state. The delusions could not be regarded as derivatives of the obsessions, though their contents were related to the same impulses and complexes as the obsessive-compulsive symptoms. In spite of the apparently overwhelming power of the impulses the personality remained well preserved. The frequent emergence of a critical attitude towards the delusions was another characteristic feature. The conception of the hostile forces expressed in the ideas of persecution was peculiarly impersonal, and was reminiscent of the tendency of the typical obsessional patient to displace his feelings from the object of his hatred and love into animals or inanimate parts of the environment. There was in this case no direct transformation of an obsessional idea into a delusion. The delusions were not projections of the obsessional ideas, but partly projected

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motivations for the sadistic impulses which the obsessional mechanisms had been struggling to hold down, partly the outward projection of the difficulties to deal with those impulses. By means of a truly paranoid mechanism the impulses were vindicated and integrated with the personality. That mechanism could be demonstrated even more clearly in Cases 9, 10 and 11.

Case 9 was a paraphrenia with depressive features. In this patient, who had a chronic obsessional neurosis, undisguised homicidal and suicidal impulses became prominent in the psychotic condition, which had been preceded by an increase of habitual neurotic symptoms and intense religious preoccupation. At the climax of the psychosis strong anal tendencies, previously sublimated and over-compensated in an obsessional manner, broke through when the ego appeared to have lost all power of resistance. In this, as well as in the other paranoid cases (10, 11, 12), the temporarily unrestricted release of primitive instincts appeared fully integrated with the aims of the personality by being fitted into a delusional system. Thus the patients conceived to experience a profound instinctual regression as a virtue of the highest order. The ego was in the delusions provided with the sanction of the super-ego. This makes it understandable how coprophagia and shameless exhibitionistic conduct, which otherwise are met only under conditions of advanced regression and disintegration of the personality (such as catatonic states, delirious conditions and advanced organic dementia), were compatible with well-preserved personalities. By means of the same mechanism the aggressive impulses in Case 8 (see above) could express themselves in a much more primitive way than is found otherwise in conditions without personality disintegration. It was remarkable how each of those patients succeeded in satisfying powerful archaic instincts and excessive moral demands at the same time in one thought or action. Such an integration of abnormal behaviour with tendencies flowing from different and conflicting impulses is clearly reminiscent of the dynamism of the "compromise character" described by Freud in the classical neurotic symptom.

In Case 11 the history was not quite conclusive of whether the obsessional features which had been present long before the onset of the psychosis amounted to an obsessional neurosis, or whether they were only the expressions of an obsessional personality type. However, the data available make it seem more likely that the patient had suffered from an obsessional neurosis for many years prior to the development of the psychotic condition.

In all cases of paranoid states (8 to 12) there was a marked tendency to remissions. The paranoid reactions observed had certain features in common with the affective reaction types. In all except Case 12, in which the paranoid states showed hypomanic features, the patients were conscious of an excessive sense of guilt resulting in a tendency to self-punishment. That sense of guilt was in the psychotic state associated with a temporary abolition of the struggle against impulses which previously the obsessional symptoms had served to suppress. The sense of guilt grew while the ego was losing control, reached its climax when the primitive instincts were being let loose and abated after their eruption, though the paranoid symptoms persisted in each except one of the cases. It seems that the appearance of depressive features, especially the excessive guilt feelings, in the paranoid reactions of those cases was based on an intrinsic psychopathological relationship between depression and obsessional illness (Abraham, 1925) rather than on a "mixed" character of the psychotic reactions. It also has to be remembered that paranoid psychoses in middle age often show features reminiscent of involutional depressions.

It was certainly not incidental that coprophagia, an otherwise extremely rare symptom except in cases with advanced personality disintegration, should occur in two cases of this series. This is not surprising considering the habitual anal preoccupation of the obsessional neurotic, which also could be demonstrated among cases of Group A.

Cases 13 and 14 had in common the benign character of the psychotic reaction which was of the type described as schizophrenia simplex. Both were patients of the Jordanburn Hospital, where only neurotic and borderline cases are admitted. Case 13 had shown obsessional symptoms since childhood, while in Case 14 they had appeared some time prior to the development of the schizophrenic reaction in an obsessional personality. In the latter case paranoid features were present for a short time. Both cases recovered.

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Heredity.—As no systematic inquiries into the family histories could be made, the data obtained are only of limited value. In a case-material such as this one may expect the presence of more than one hereditary determinant. Some of the data obtained are of interest in connection with the findings of other authors. It is proposed to deal first with the findings suggesting a constitutional predisposition to psychotic reactions, and secondly to consider the predisposition to obsessional symptoms. In Group A there had been depressive psychoses in the ancestries of Cases 1, 5 and 7. In Case 1 atypical paranoid features similar to those of the patient had coloured the psychoses in the previous generation. One of the siblings of Case 4 had been schizophrenic. In Group B psychotic reactions with both paranoid and depressive features had occurred in the family of Case 9. There had been an unspecified delirious condition in the family of Case 10. In Case 11 there had been a case of conversion hysteria and one of mental deficiency among the relatives. Marked obsessive-compulsive symptoms in the ancestry and among the siblings could be established with certainty only in Cases 5, 8 and 12. A more thorough investigation which was impracticable would probably have revealed obsessional features in the family histories of some of the other cases.

Personality traits.—The pre-psychotic personalities had shown the well-known obsessional character traits in all the cases presented. In Cases 1, 4, 5, 6, 8 and 13 those features had existed on the background of a syntonic personality type, while in the rest the personalities had been of the schizothymic (shut-in) type, irrespective of the nature of the psychotic reactions. The frequency of that personality type in this type of cases is in keeping with Luxemburger's (1927) statement that the schizothymic personality is common in the ancestry of obsessional neurotics and in the patients themselves. It also conforms with the results of Bowlby's (1940) personality studies.

Discussion.

From the material presented certain facts have emerged which in some respects confirm findings of previous writers, but also throw new light on the problems of the relationship and the interplay between obsessional phenomena and psychotic reaction types. A case-material such as this or the one presented by Gordon (1926) provides strong arguments against the assumption that obsessive-compulsive symptoms are related exclusively to one group of psychotic reactions. It rather suggests that obsessional illness develops on the basis of an independent constitutional predisposition which may in individual cases be associated with either the manic-depressive or the schizophrenic predisposition, or sometimes with both.

It has been suggested that the obsessive-compulsive symptoms in patients who develop a schizophrenic condition differ from those seen in cases where the psychotic reaction type is of the nature of an affective psychosis. Bowlby (1940), quoting Mapother, expressed the opinion that " meaningless " obsessional ceremonials were suggestive of an impending schizophrenia. Mapother and Lewis (1941) maintained that in cases in whom the obsessional ceremonials were of a magical type schizophrenia was in the offing. It is doubtful, however, whether much reliance can be placed on that differentiation. Freud and other psychoanalytic writers have described magic thinking and the tendency to magic ceremonials as a common feature in obsessional neurotics which can be demonstrated more or less clearly in practically every case. Furthermore, it is questionable whether there exist " meaningless " obsessions. The impression that they occur in schizophrenia may be due to the fact that the schizophrenic is more often than the obsessional with or without depression unable or unwilling to divulge the thought contents underlying the ceremonials or to co-operate in tracing them. The knowledge of those thought contents would prove an apparently meaningless ceremonial, if it is obsessional at all, to be meaningful.

In dealing with the results of the interplay between obsessional and psychotic manifestations it is proposed to discuss the cases with affective reactions first. The predisposition to obsessional neurosis coincides much more often with that to affective psychosis than to schizophrenic conditions. However, it is doubtful whether this justifies the inclusion of obsessional illness among the affective reaction types. Even Abraham (1927), who was the first to study the deep structural

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similarities between obsessional neurosis and depressive states, insisted that the dividing line between them should be maintained, though he admitted that they often shade off into each other. He asserted that the personality features of manic-depressives were similar to those found in obsessionals. It is questionable whether this is generally correct, though it has been found to be the case in the pre-psychotic personalities of cases with involutional depressions (Titley, 1936, 1938). It does not apply to the rank and file of the manic-depressive cases, and it seems that Abraham's statement was based on impressions gained in the psycho-analytical treatment of that special group of cases in whom depressive states occur on an obsessional background. This is all the more probable since the typical manic-depressive case is unlikely to subject himself to psychoanalysis during the periods of depression or in the intervals between them. The obsessional, however, who even during the periods of depression preserves insight into at least some of his symptoms, is more likely to provide the co-operation necessary for psychoanalytical treatment.

The case-material presented in this article demonstrates the various modifications to which the habitual obsessional symptoms are subjected in the course of the depression and vice versa. They may either decrease or become more prominent. The latter has been the case more often than the former in this material. In addition, new obsessive-compulsive symptoms, usually of an undisguised aggressive-destructive type, may appear for the duration of the depressive state. Self-accusations with familiar contents may be subjected to obsessional doubts, with the result that they come to resemble phobias projected into the past. While the typical obsessional neurotic is preoccupied with the fear of doing wrong and with precautions against such impulses, and while the typical depressive patient may be convinced that he has sinned, the obsessional going through a period of depression tortures himself with the idea that he may have done wrong in the past, whereby a critical attitude to those thought contents is never completely lacking. Both the similarities of and the differences between obsessional and depressive mechanisms and attitudes are well demonstrated in this interaction between them. The prominence of aggressive-destructive tendencies, which in these cases are directed against the outer world to a much greater degree than in the typical depressions, can again be attributed to the obsessional character traits released during the depression. Among these character traits, hatred, which in the obsessional neurosis often remains unconscious, is one of the most important (Jones, 1929). The depression exposes it mercilessly.

As far as could be ascertained, no case has been reported in full in which a frank manic condition developed in an obsessional neurotic. It is true that in Cases 1 and 4 there was a suggestion of slight hypomanic periods, but they were still within the limits of cyclothymic mood swings. The fact that mania does either not occur in obsessional neurotics or is extremely rare, though depressive states are far from uncommon, may be due to the well-known characteristics of the obsessional personality, which would not allow freedom from inhibition for any length of time. One may speak of a dynamic incompatibility of obsessional neurosis and the manic type of the affective reactions. The occurrence of cyclothymic mood swings among the cases presented in this article argues against the assumption of a constitutional antagonism. At any rate, psycho-pathologically it is hardly conceivable that obsessive-compulsive symptoms can co-exist with a typical mania.

As has been mentioned above, the depressive states occurring in obsessionals are nearly always characterized by the prominence of strong aggressive tendencies. It is known that features of aggressiveness directed against external objects are not unusual in depressive states in non-obsessional patients (Lewis, 1934; Oltman and Friedman, 1943), but they are not, as a rule, so prominent and undisguised as in the depressions of the obsessionals. The emergence of aggressive-destructive tendencies during the depressions of the obsessionals may express itself either in the appearance of new obsessive-compulsive symptoms of an aggressive-destructive character and/or in increased aggressiveness in the general behaviour. In other cases the habitual obsessional symptoms may recede without any new ones emerging, as happened in Case 7, where the patient was subjected to cruel imaginary attacks from outside during the depression. Possibly those two behaviour types, the one actively aggressive, the other suffering, reflect the two aspects of the sado-masochistic instinct which is characteristic of the obsessional character. It may not

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be incidental that in the case exhibiting the passive type during the depression the obsessional symptoms, which are a means of dealing actively with conflicts, were absent.

The high incidence of obsessions and compulsions with undisguised aggressive-destructive thought contents occurring in the course of depressive states has been noted by Vurpas and Corman (1933) and Lion (1942). Those authors studied cases in which the obsessional symptoms occurred only in the course of the depressions. Henderson (1937) has described a case where, during the depression, the obsessional fear of kicking people was the most prominent symptom. Bowlby (1940) has reported a very similar case. The comparative frequency of aggressive compulsions in periods of depression can also be well demonstrated in Lewis's (1934) series of depressive states. Obsessional symptoms of a destructive nature directed either against external objects or the self, and occurring during depressive states in patients who had not been obsessional neurotics previous to the depressions, have been observed at the Jordanburn Hospital on many occasions. The following cases illustrate this feature: A 19-year-old girl with a compulsion to wish her mother's death and of doing herself harm; a 20-year-old girl with aggressive blasphemous ideas; a 42-year-old woman with compulsions of smashing glass and throwing herself from the window (this patient gassed herself); a 42-year-old woman with compulsions to stab and poison people; a 50-year-old woman with suicidal compulsion and the obsessional fear of hitting her son; a 37-year-old woman with compulsions to bite her tongue off and to whip herself, to which she sometimes gave way to a certain extent, etc. There are, of course, other cases in which compulsions and ruminations of a non-aggressive nature occur in the course of depressions; and there are, of course, many obsessional neurotics with aggressive-destructive compulsions, but the incidence of obsessional symptoms of that type is comparatively much higher in depressive states than otherwise. Lewis (1934) has pointed out that in all cases in which obsessional symptoms occur in the course of depressive states obsessional personality traits could be readily demonstrated. This finding is borne out by the experience of the present writer. All those observations go to show that depressive states occurring in obsessional personalities are apt to bring to the surface strong aggressive-destructive tendencies, irrespective whether or not an obsessional neurosis had been present.

The emergence of those tendencies in the course of depressive states has an important bearing on the question of suicide. Though traditional teaching rightly insists that every case of depression of a constitutional type is potentially suicidal, there is no doubt that the actual danger is not the same in every case; but hitherto clinical experience has given us no guidance as to the categories of cases in which the danger is greater than in others. The experience of the writer has led him to believe that in depressive states associated with obsessive-compulsive symptoms the danger of suicide is higher than in others, irrespective whether the obsessional symptoms take the form of a suicidal or some other compulsion. The same seems to apply to obsessional cases who develop paranoid reactions. Among the 14 cases presented in this article 5 made serious suicidal attempts, 2 of the cases belonging to the depressive and 3 to the paranoid group. Of the cases mentioned above in which obsessional symptoms occurred only in the course of the depression, one committed suicide. Those numbers are too small to be of any value, but they are of interest in combination with the cases reported by Gordon (1926) and Lewis (1934). Of Gordon's three cases of depressive states developing in obsessional patients, two committed suicide, and of his three cases of paranoid psychosis with the same kind of previous history, one killed himself. A study of Lewis's 61 cases of depressive states reveals that among those who showed obsessional symptoms prior to or during the depression the incidence of suicidal attempts was proportionally much higher than in the series as a whole. It seems that in depressions arising in obsessionals, the tension arising from the neurotic personality trends and the increase of aggressiveness which in the depression is readily directed against the self give additional impetus to the suicidal tendencies. The obsessional neurotic, even without depression views death as the solution of conflicts more than he readily admits. Freud (1917) spoke of the habitual preoccupation of the obsessional with the "death complex."

The fact that in depressions occurring in obsessional neurotics and in patients of the obsessional character type the aggressive tendencies are often predominantly

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directed towards external objects, and that the obsessional symptoms may overshadow the others, is apt to modify the clinical picture of the depressive state considerably. The prevailing affect may be "impure" as compared with that of the typical depression. Lion (1942) has noted that feature in depressive states accompanied by obsessive-compulsive symptoms, and this was one of the reasons why he proposed to designate them as "anancastic depressions." In the cases presented in this paper the impurity of affect as compared with that of the typical depressions was noticeable. The depressive mood is not always very obvious, and does not dominate the clinical picture in those patients who are constantly engaged in fighting their obsessional ideas and compulsions. Many psychiatrists are inclined to look at a depression associated with obsessive-compulsive symptoms as a natural reaction to those symptoms, thus adopting the explanation usually advanced by the patients themselves. Bonhoeffer (1913) refuted that explanation in pointing out that some of those patients had previously had typical periods of depressions unaccompanied by obsessional symptoms. This can be corroborated by this case-material. It can also be shown that the symptoms of depression may precede the appearance of obsessions, and that the depression may not clear up, or it may even get worse for a time after the disappearance of the obsessive-compulsive symptoms which had emerged at the onset of the depression. The regular occurrence of marked evening remissions of both the depressive and obsessive-compulsive symptoms is a feature which those cases have in common with many typical depressive states, but not with cases of obsessional neurosis. It also is significant that in the family histories of such cases the incidence of depressive states was apparently as high as in the family histories of patients with typical depressions. The differential diagnosis between obsessional neurosis and constitutional depression in an obsessional personality is not without practical significance. As in the latter the depressive affect is usually impure, and the clinical picture is dominated by obsessive-compulsive symptoms, such cases are often described as periodical or cyclical obsessional neuroses. In some of those cases the obsessional symptoms which developed during the depressions are so spectacular that they not only make the examiner overlook the underlying depressive symptoms, which may be impure, but also distract his attention from much less spectacular obsessional symptoms which have been present for many years. They may not always be easy to establish, as the patient under the impact of the new obsessional symptoms is inclined to make light of his previous obsessions and maintain that he had been quite well before. The unqualified inclusion of the "cyclical obsessional" among the typical obsessional neurotics is bound to make the recovery-rate in obsessional neurosis in general appear much more favourable than if one regards them as a group of patients in whom obsessional symptoms appear on the background of a constitutional depression, and does not count them together with the typical obsessionals. In the latter class of patients the prospects of spontaneous recovery are far from favourable. It is true that even the typical obsessional neurosis developing in childhood or adolescence shows a tendency to fluctuations which sometimes may, on superficial observation, result in the impression of a recurrent or even periodical condition; but in cases in which obsessional symptoms appear and disappear suddenly and the same symptoms reappear for a period, a careful consideration of the whole clinical picture and the previous history usually reveals the presence of a depressive condition. Among a material of 25 cases treated at the Jordanburn Hospital (not including the patients reported in this paper) and at some time diagnosed as obsessional neurosis, 5 had been cases of recurrent depressions during which obsessional symptoms had been prominent. Five of the seven cases of depressive states in obsessional neurotics reported in this article had been diagnosed as obsessional neurosis during the course of their depressions. It is easy to understand the mistake. In the writer's opinion it is possible to distinguish clinically between the moodiness and morosity of the typical obsessional who, as a rule, leads an active life, and the features of a depressive state, even if it be modified by obsessive-compulsive symptoms. Neither the cases presented in this paper nor those reported in the literature allow of a definite statement as to whether the prognosis of depressive states occurring in obsessional neurotics differs from that in cases without obsessional symptoms as far as the depression is concerned. If, however, the danger of suicide is taken into account, the prognosis is less favourable.

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The differential diagnosis between obsessional neurosis with fluctuations and depressive states in an obsessional neurotic personality or an exacerbation of habitual obsessional symptoms in the course of a depression is of importance also from the therapeutic point of view. In cases where obsessive-compulsive symptoms occur in the course of a depression, electric shock therapy would appear more promising than it has proved to be in the typical obsessional neurotics. It is equally clear that leucotomy, which has been advocated for cases with long-standing and severe obsessional symptoms, is not indicated in patients in whom the prognosis of obsessional symptoms, however severe, coincides with that of a recurrent depression with long intervals during which the patients may be free from symptoms or suffer only from a mild obsessional neurosis.

The investigations into the individual characters of obsessional symptoms occurring in association with depressions in obsessional neurotics have shown that a relation to previous obsessional preoccupations can often be traced. This could also be demonstrated in the much rarer cases of obsessional neurosis in which a paranoid state developed. Often a particular symptom was related to a manifestation of the previous obsessional neurosis, e.g. to a phobia, like the positive to the negative of a photograph. This can be attributed to the loss of the capability for repression which is characteristic of psychotic reactions in general. Henderson (1916), in a study on catatonia as a type of mental reaction, demonstrated the eruption of repressed tendencies which could be traced to conflicts of the prepsychotic personality. His patients exhibited primitive regressive conduct similar to that of some of the cases presented in this paper. Henderson's catatonic patients, however, acted in a state of disintegration of the personality, while in the cases described in Group B of this series the release of primitive instincts was integrated with the personality. It has been suggested above that this difference was due to the action of integrating forces which are at the disposal of the obsessional neurotic personality. This may also explain the fact that neither among the cases presented in this paper nor among those reported in the literature was the psychotic reaction occurring in an obsessional neurotic of the catatonic type, or of the hebephrenic, both of which are characterized by temporary or progressive personality disintegration. The absence of these schizophrenic reaction types in such cases may be responsible for the view expressed by some authors that there is a special relationship between obsessional neurosis and paranoid states. Another feature of paranoid reactions occurring in obsessionals is the frequent emergence of doubt in the reality of their delusions and hallucinations. Considering that the obsessional neurotic is constantly preoccupied with proving and testing reality, and that doubt is one of the essential features of his emotional life, one is justified in regarding that peculiarity, too, as an expression of the underlying obsessional traits. Another characteristic of the schizophrenic reaction types occurring in this type of patients is their tendency to remissions. Neither in this series nor among similar cases of other writers did malignant progressive deterioration take place, and in the few instances reported in the literature where deterioration did occur it developed slowly over many years. Mapother (1912) obviously had this type of patient in mind when he remarked that " a very large number of cases remain intermediate in type between constitutional psychasthenia and the schizophrenic-paranoid group." We recognize in them a certain type of " borderline cases " between those two conditions.

The feature of a comparative benignity of the psychotic reaction also seems to characterize cases in whom a schizophrenia simplex develops in personalities with obsessional trends. Cases 13 and 14 represent that group in this series. It seems that in those patients the obsessional personality structure frustrates, subdues and aborts the schizophrenic reactions, makes them mild and/or short-lived, and leaves behind, as a rule, only a degree of emotional flatness. The fact that in those cases the schizophrenic features are often only vague and mixed with obsessional symptoms, which in the course of the psychosis may lose some of their distinctive characters, make those patients appear as borderline cases and difficult to diagnose. Though probably not uncommon, they are little known to the hospital psychiatrist, as they only rarely enter a mental hospital. They are better known to psychiatrists and psychotherapists working outside the mental hospitals. Those cases probably form a group among the great number of cases which Zilboorg (1940) called " ambulatory " schizophrenia. In discussing the problem of schizophrenics

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who never enter the mental hospital, Brill (1940) described a case of obsessional neurosis with recurrent mild schizophrenic episodes.

The view that the obsessional personality structure exercises a modifying influence on psychotic reactions can be corroborated from the literature. Mayer-Gross (1928) spoke of " pathoplastically veiled " clinical pictures of schizophrenic conditions occurring in obsessional neurotics. The comparatively favourable outlook of psychotic reactions preceded by or associated with neurotic manifestations has been noted by Zilboorg (1931), Myerson (1936) and Miller (1940), who looked at the psychosis as a breakdown in the efforts of the patients in meeting life after the failure of achieving that aim with the help of neurotic compromise. Miller, though not referring specifically to obsessional neurotics, suggested that one might expect a favourable course of a psychotic reaction in patients with relatively stable personality structures. One of the cases reported by him is very similar to the schizophrenics reported in this series. Kahn and Cohen (1932) described a schizophrenic patient with obsessional symptoms in whom the psychosis took an unusually benign course. They expressed the opinion that the obsessional and paranoid predispositions acted towards a non-regressive integration. They noted in their case a remarkable objectivity and critical attitude towards psychotic experiences—a feature which could be demonstrated in most of the cases presented above. Lange (1925), in a study on paranoia, remarked that in patients exhibiting obsessional symptoms the paranoid development seemed to take a favourable course, and he attributed this to the alleged fact that weakly and unenergetic individuals did not often become subject to progressive mental illness. The validity of that explanation may be questioned. That author, like Janet (1903), in his conception of psychasthenia, saw only those features of the obsessional neurosis which might be called the " negative " symptoms. It was the merit of Freud, Abraham, Jones, Glover and other psychoanalytic writers to describe the "positive" symptoms by demonstrating what the obsessional personality could achieve in the struggle against constitutionally strong impulses. Glover (1932, 1935) spoke of the " buffer function " of the obsessional symptoms. He sees their task in permitting a flight from the anxieties of advancing development and in stemming regression at the same time. He regards the obsessional symptom as a defence mechanism far superior to the hysterical and, in his view, the complexity of the obsessional neurosis is a tribute to the scope, vigour and elasticity of its defensive function. In this connection it is interesting that one of the first cases of obsessional neurosis analysed by Freud later developed a paranoid condition from which he recovered. That case provides another example of the comparatively benign character of paranoid reactions occurring in obsessional neurotics. The psychotic phase of that patient and its structural relationship to the previous obsessional neurosis has been studied by Brunswick (1928). That case is also of interest from the point of view of hereditary predisposition : an uncle of the patient was an obsessional neurotic, the father manic-depressive and a sister schizophrenic. Coltof (1938) has described another case in which a paranoid reaction occurred in an obsessional neurotic ; in his case, too, a far-reaching remission ensued. All those observations lend support to the views expressed in this article about the results of the interaction between obsessional symptoms and schizophrenic reaction types. It is not intended to discuss here the interaction between hysterical symptoms and personality traits and psychotic reactions. Clinical experience seems to suggest that the integrating and synthesizing power of the hysterical personality structure is inferior to that of the obsessional.

The question whether obsessional ideas may be transformed into delusions has attracted the interest of psychiatrists, especially at the time when the descriptive aspect was all-important. While Pilcz (1926) answered the question in the negative, Gordon (1926), Lewis (1936), Henderson and Gillespie (1940) a.o. maintained that such a transition did occur. The answer to that question depends on what is understood by the transition of an obsession into a delusion. No case has yet been reported in which the patient felt that the thoughts previously experienced as products of his own mind were made outside his ego. It has often been said that it is only a short step from experiencing an obsessional idea to believing that that unpleasant thought content is the product of outside forces. Yet it seems that this step is never taken. It does happen, however, that the instincts, desires and fears which the obsessional idea or compulsion served to suppress or control, and which

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often remain unconscious, appear in consciousness by the way of projection. It is not the obsessional idea or the compulsion that is projected, but something that was represented by the obsessional idea in a distorted and often unrecognizable form. This happened in some patients of this material and in cases reported in the literature. In this sense the statement that obsessions may change into delusions is to be confirmed. The fact that a direct projection of obsessional thoughts does not take place is in keeping with the view that the obsessional symptom is the by-product of a defence mechanism, and that one of the functions of that mechanism is the conservation of the unity of the personality on a level on which the relationship to reality is still undisturbed. The persistence or the emergence of true obsessional ideas during a psychotic reaction seems to indicate that the individual has not fully parted with reality.

The case-material presented does not allow of any definite statements about the causes of psychotic reactions in neurotic patients. In none of the cases could the development of the psychotic state be related with certainty to a traumatic event in the patient's life, though in Case 12 the death of the husband, in Case 14 courtship, may have acted as sources of additional stress. If one adopts the dynamic conception of the development of mental disorder as a working hypothesis one may, in accordance with the authors mentioned above, be justified in regarding the psychotic reaction as the result of a breakdown in the fight against odds which the patient had previously attempted to meet by the aid of neurotic defence mechanisms. Such a view is not incompatible with the assumption that the choice of a specific neurotic mechanism and of the type of psychotic reaction is dictated by constitutional predispositions.

Conclusions.

Clinical aspects of the relationship of obsessive-compulsive symptoms to psychotic reaction types have been investigated. Depressive and schizophrenic (including paranoid) states occurring in obsessional neurotic patients have been observed. The interplay between obsessional symptoms and psychotic reactions has been studied. It has been demonstrated that depressive states occurring in obsessional patients show atypical features which can be attributed to the modifying influence of obsessional mechanisms. The prevalence of aggressive-destructive obsessional ideas and compulsions during depressive states occurring in obsessional patients has been pointed out. Those symptoms could be related to previous obsessional preoccupations. A higher incidence of serious suicidal attempts has been found in this type of case. The diagnosis of depressions in obsessional neurotics has been discussed. In the patients of the schizophrenic group it could be demonstrated that the psychosis often resulted in a release of primitive impulses which had previously been kept under control with the aid of obsessional symptoms. The question of transformation of obsessions into delusions has been discussed. The symptomatology and the course of the psychotic reactions in the cases presented and in cases reported in the literature suggested that the obsessional personality structure exercises a strong integrating influence. Regressive conduct, otherwise observed only in states of severe personality disintegration, was found to be fully integrated with the personality, which remained well preserved. There was a marked tendency to remission in the schizophrenic cases. The opinion has been expressed that the obsessional personality structure is capable of subduing and aborting schizophrenic reactions. It also could be demonstrated that the excessive inclination of the obsessional neurotics to reality proving and doubt affected their attitude to psychotic experiences in a favourable way.

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MASQUERADING IN UNIFORM: A WARTIME FORM OF PSYCHOPATHIC BEHAVIOUR.

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THOSE who read the Police Court reports in the newspapers—and every psychiatrist should!—will have read, since the war, of persons guilty of unlawfully wearing military uniform or medals. Often the crime appears to be due, not to ordinary motives of gain, but to motives of personal prestige. Seven cases of this disorder of behaviour have been observed at the Royal Edinburgh Hospital for Mental and Nervous Disorders, and in these cases at least the problem has been one of gravely disordered personalities. It seems worth while reporting the cases, as so far little psychiatric interest has been taken in them. Petrie (1942) and Rossiter Lewis (1942) have each referred briefly to one case. Three of the cases were included in the figures in a previous paper on psychiatric states in ex-service patients (Stalker, 1944), but in one of these the masquerading was not known at the time. Their case-records were not reported in that paper.

CASE 1.—A man, aged 20, attended the Out-Patient Department of the Jordanburn Nerve Hospital in 1944. The paternal grandfather lost his business through alcoholism; a paternal aunt was a chronic neurotic; the maternal grandmother is hypertensive, and a maternal cousin had an illegitimate child. The father died eight years ago, after cholecystectomy; the mother then became depressed and sleepless and had a functional weakness of the right hand. Before long she was able to look after their small business, and was out most of the day. In the last war several cousins served, and an uncle lost his leg.

The patient did not walk until he was two years old. Between 8 and 12 he was very fond of playing with guns, of which he collected 24. He never had friends, and was only popular when he shared his guns with other boys. He was at school to age 16, but his progress was very poor. His I.Q. was found to be 97 per cent., but the masters thought him a day-dreamer. At 12 he put the teacher's scarf in the ashbin and overturned all the chairs in the cloakroom. His mother questioned him daily about his school work, and now fears this may have led him to lie. He told lies to get to the cinema, and was keen on detectives, gangsters, cowboys, etc. He was frequently unfit for school owing to chest trouble and "rheumatic pains." On leaving school he was idle for some months and then had three short jobs in domestic service, his admitted desire being to come into contact with the upper classes.

He tried to join up several times, but was rejected as being too young, lacking educational qualifications, etc. Then he went to a Wireless College, but ceased to attend after a week, as he could not keep up with the work. He continued, however, to travel daily from his home town to Edinburgh. Then he bought and wore a Merchant Navy uniform, and told his mother he had qualified and was to have a job. In the meantime, at an ordinary recruiting medical examination he was found unfit owing to poor physical development and some minor physical defects. He continued to make efforts to enlist. Then he told his mother he had been transferred to the Royal Navy, was working in the Intelligence Department, would receive no pay for a year, and asked her to advance him money. This she did for over six months. He wore the uniform of a sub-lieutenant, of which he bought three; travelled daily to Edinburgh on the noon train, reading the *Times* and carrying books under his arm; had his meals in hotels and restaurants; went frequently to cinemas, theatres, concerts, and art galleries, and reached home about midnight. Several times he travelled to London, Glasgow and Aberdeen to attend concerts. At home his mother received telephone messages and telegrams almost daily, ostensibly for him from the Admiralty. He telephoned his headmaster, representing himself as the Admiral at a local base, and asked for his own character.

When he was arrested the police opened a locked cupboard in his room. In it were found 569 gramophone records ("all high-class stuff—not a single jazz record among them"), American magazines, books (e.g. *Who's Who*, *Sherlock Holmes*, books by Kipling, books on Lawrence of Arabia, Tolstoi's *War and Peace*, and books in French and German), first-aid kit (including scalpels, syringes, antiseptics and analgesics), and holsters, belts and whistles. The mother found her total outstanding indebtedness to be over £1,000, and had to sell her house to meet it.

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The patient was sent to prison for 30 days. On examination he was meek and unimposing in his manner and gave a detailed account of his delinquencies. He said that at one stage he had worn bandages on his head and told people he had been hurt; that he had bought the uniforms to be the same as his contemporaries who were serving. He alleged that he had purchased popular books on psychology and that he had, during his masquerading, thought of consulting certain well-known psychiatrists in Edinburgh and in London; he certainly knew their names and addresses correctly. He claimed to have been always quite alone during his misdemeanours; to have had no relations with women and, in fact, to have had no sexual knowledge until enlightened by his own doctor six months before.

The patient remained unemployed for some time. He still wanted to join the Forces, and kept applying for "para-military" work with the Red Cross, Church of Scotland Canteens, etc. Eventually his mother insisted on his taking a job as a labourer on an aerodrome. A few weeks later he went straight from his visit at Jordanburn to a Government Department. There he convinced a senior official that he had served 3½ years in the Fleet Air Arm, had crashed and been treated in a Head Injuries Unit in England (name given correctly), and had been discharged; that he was now working at an aerodrome as a labourer, but the officers were not pleased that he, a discharged officer, should be employed in so humble a capacity, and had advised him to consult this Government Department.

Case 2.—A man, aged 21, was in Jordanburn in 1941. The father served for 3½ years in the last war, but poor vision prevented him from going overseas. He died of coronary thrombosis soon after the patient's discharge from hospital. The mother is very nervous, worries to excess, and is subject to fatigue and alleged heart symptoms, said to have been brought on by the patient's serious illness 12 years before. The eldest brother is asthmatic. The second was in the Army before the patient's trouble began; he always got on well with this brother and tended to hero-worship him. The patient is the third surviving sibling.

As an infant the patient was bad-tempered, cried a lot, and was difficult to care for. As a child he was afraid of crabs, was a nail-biter, and a schoolmaster said he looked as though he had chorea. At 9 he was dangerously ill with rheumatic fever following scarlatina, and his parents were told there was no hope of his survival. After six months in the fever hospital he was an invalid in bed at home for two years, his bed being in his parents' room. He had to have everything done for him and was thoroughly spoiled; "he got anything he wanted so long as it would keep him amused." He had a big collection of toy soldiers, with which he played at battles. "Every time his mother went out he wanted more soldiers." In retrospect, he alleges that he was unskilfully treated during this illness and is antagonistic to the medical profession. He still has a fear of again being confined to bed.

After returning to school he was twice absent for three months with rheumatic symptoms and was not allowed to play games, and left at 18 without matriculating. He had two posts as a laboratory boy, being discharged from each as unsuitable within a few months. His parents then sent him to a college for a year and he matriculated. The next year was spent at a technical college, where he did not achieve pass marks. His instructor thought him queer, pathetic, and rather grandiose in his ideas. At this time the war began and the patient again became a laboratory boy, and was later in the Home Guard and in the A.R.P. service. He was upset on hearing that friends had been killed at Dunkirk.

His serious delinquencies apparently came on suddenly, a few days before his admission, but there was some evidence that for a time he had been speaking in a grandiose way of himself and of his academic achievements. He had made repeated attempts to join the Forces, but was always found unfit because of heart disease. The last attempt was only three weeks before his offences. He stole £18 from his father's desk and obtained a cheque book from the bank, saying it was for his father. He went to a town in the west and made several unsuccessful attempts to obtain a uniform from tailors. Returning home, he succeeded in purchasing from a well-known firm the uniform of a full lieutenant in the Royal Artillery. This he wore during the rest of his escapades and he stayed in hotels. He bought a motor car, presenting a cheque forged with his father's name, but the firm took the car back when they saw he could not drive it away properly. In another town he actually got a car by the same means, and also bought a typewriter and a wireless set. He managed to drive a considerable distance before he was arrested. After a psychiatric examination in prison the Court agreed to his admission to hospital. On the way out of Court he said to his lawyer, "Will I lose my degree over this?"

With complete assurance he told the physician, who already knew the true story, the following things, which were all untrue: That he played rugby and did cross-country running; that he had taken some classes at the University, had walked the wards of the Royal Infirmary, had gained the London External B.Sc., and was working for the A.I.C.; that he was doing research, had evolved a patent gas detection substance, and was writing papers on "The Structural Comparison of Adrenaline and Nicotinic Acid" and on "Micro- and Semi-Micro Estimations of Metals of the Tungsten and Tantalum Groups." He claimed to have a partial amnesia for his delinquencies. He found his way to the hospital laboratory and offered to assist the biochemist, saying he had the London Triple Honours B.Sc., the A.I.C., the A.M.I.C.E. and the Medical First Professional. He referred by their first names to various local biochemists, and was able to say (correctly) what subjects they were doing research on at the time. He concluded with a partial account of his delinquencies.

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The patient gradually said less and less about his alleged achievements. He claimed to have been very embarrassed and ashamed of himself because he was a civilian, and to have thought that people were criticizing him for this. While he had worn the uniform he had felt very elated, could look his fellow beings in the face and felt as if he were a real officer in the Army. There is no evidence that he utilized the uniform to glorify himself in the eyes of those who knew him, except once, when he went to his former Technical College and spoke of the military work he was doing. Physically his general development was poor, and a cardiologist found a definite, but well-compensated, mitral valve lesion.

In October, 1944, his people were interviewed. They said the patient had stayed at home for a year, doing very little work, and still tending to speak in a grandiose way of himself. He had then left home and had not been heard of for two years.

Case 3.—A man, aged 22, has been treated in both Jordanburn and West House Mental Hospital. The mother has many anxious and hysterical symptoms, and is probably psychopathic in her behaviour. The father volunteered in the last war, concealing that he was under age, saw service in France and became a lieutenant, although he was only a working man. He re-enlisted at the beginning of this war, was in France again, and is now a captain in the Army abroad. The mother neglected the children, and finally deserted them when the patient was about 5. She is now divorced and married again.

As a child the patient was frequently ill with chest trouble, and he is still of poor physical development. At 15 he was involved with a gang of boys who stole cars; they had an accident and appeared in the Juvenile Court. At the father's suggestion the Court suspended sentence to allow the boy to enter the R.A.F. At the outbreak of war he trained as an air-gunner and was soon involved in a forced landing in 6 ft. of water; no one was seriously injured. Returning to flying duties, he took a panic attack when, during a routine patrol, he found his gun was out of action. He was in a military psychiatric hospital suffering from depression, sleeplessness, and an occasional hysterical convulsion; and was discharged unfit in the summer of 1940. Soon he succeeded in joining the Army. A week later he became depressed and tremulous after an air-raid and was admitted to another military hospital, where he attempted suicide.

To his friends and to the physicians in the military hospitals and in Jordanburn he averred that he joined the R.A.F. as a career; that the crash was in the middle of the North Sea, after the petrol tank had been punctured by an air attack; that other members of the crew were killed or wounded; and that he had a head injury with unconsciousness and was adrift for some hours. The second episode became an attack by a German plane, in which his gun jammed and they only escaped by getting into clouds.

Discharged from the second military hospital to his mother's house, he made repeated attempts to join the Air Force again. He did act as an instructor in the Air Training Corps in the evenings, and wore the A.T.C. uniform when he was not on duty. He stole from his mother and step-father; drove his step-father's car without permission, having no driving licence, and damaged it; drank heavily; was unable to keep a job; and was absent from home for a time, and came back alleging that he had been in the Navy. Then he was arrested for stealing overcoats from restaurants and was placed on probation. He repeated the offence and was sent to Jordanburn by the Court. On admission his first act was to produce papers about his Air Force career, photographs of himself in uniform, and a newspaper photograph of himself instructing A.T.C. cadets. He claimed to have mistakenly "recognized" the "killed" members of his crew in the street and expressed a strong desire to re-enlist. He was depressed, sleepless, very off-hand about his delinquencies and claimed a partial amnesia, which probably did not exist. He was very proud of his father's military record, and embellished it by saying his father was now a colonel.

Soon after his discharge he was again arrested for theft and for wearing an Air Force uniform —he had had to resign from the A.T.C. because of his offences. It was his A.T.C. uniform which he had altered to an R.A.F. air-gunner's uniform. In prison he attempted suicide by cutting his throat with a razor blade the morning he was due to appear in Court and was sent to West House under certificates. Four months later he escaped and has not been traced.

Case 4.—A man, aged 22, was under treatment in the beginning of 1940. The father was a very wealthy man and the patient had every opportunity in life, such as education, that money could buy. When the patient grew up his father settled a large sum of money on him so that he was financially independent. The elder sister has shown certain manic-depressive traits. The younger brother was an officer in the Army before the patient's trouble began.

Little abnormal was admitted in the patient's childhood. He was at boarding-schools, where he was quite popular, but his work was very poor and the headmaster advised against University studies. His father advised a business career, but the patient had wished to take up medicine since he was a boy and decided to do so. He entered a medical school, where he did his preliminary sciences and then, having passed the examinations in Physics, Chemistry and Biology at Oxford, reported to his Dean that he was proceeding to residence at that University. He did not do so, but for the next three or four years, however, he pretended to his father that he was attending the medical school, and from time to time gave glowing reports of his progress. The father was very pleased with this and gave dinner parties in his honour, to which the local gentry and the family doctor were invited. In 1938 the patient claimed that he had

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gained honours in the classes of medicine and surgery and came home with a silver cup, engraved with his name as the most distinguished student of his year. During these years he stayed in a club where his father had friends, and the father received reports from these friends that he was behaving quite satisfactorily.

Next the patient told his father that he wished to study medicine in Germany, as many of the references he required in his work were German and he wished to learn the language. The father took him to Germany and placed him in the household of a business friend. The patient ostensibly continued his studies there. After his return he bought a motor boat and a racing car. In October, 1939, he went to another medical school—again for the alleged purpose of pursuing his studies. All this time the father had no suspicions.

About two weeks before his arrest in December, 1939, he called on the family doctor, wearing the uniform of a Naval Surgeon-Lieutenant. When the doctor expressed surprise at this, the patient said that a few of the more promising students had been given a special Final Examination. The day before his arrest he 'phoned his mother, on the occasion of her birthday, and regretted he could not come home as his convoy was about to sail. He was arrested in a leading hotel, for wearing a naval uniform unlawfully. The police found he possessed the complete kit of an Army officer as well; it was also alleged that he had pretended to be a spy. After a psychiatric examination in prison he was transferred to psychiatric care. He claimed to have a partial amnesia for his recent escapades, and he seemed to lack appreciation of the seriousness of his conduct. He expressed a strong wish to join the R.A.F. as a pilot, saying he did not know the meaning of fear and had always craved for adventure.

Physically there was a (verified) history of several nasal operations during his "student" years. At one point he had been very ill with septicaemia and had required a blood transfusion.

Case 5.—A man, aged 25, was in Jordanburn at the end of 1943. The father, an engineer, was employed abroad for many years, so that the patient saw little of him until his latter years; he was in a reserved occupation during the last war; he died of hypertension six years ago. There is one brother, nine years older than the patient, who has been very successful in business. The patient was very attached to both his father and brother, and admired them greatly. He later formed strong attachments to male friends at school and at work.

All his life the patient had a severe stammer, which caused strong feelings of inferiority. Between 2 and 8 years he had several operations for inguinal hernia and for abscesses of the buttocks. He was afraid of the dark, of being left alone and of confined spaces. From childhood he indulged in day-dreams in which he was always the hero, impressed his father and brother, and was able to help them. As he grew older he tended to spend more money than he could afford and to tell stories which were not true.

When the patient was 19 his father died, and this was a great blow to him. As a result he absented himself from his work as an engineering apprentice, but hid this from his mother. When she was informed by others, he had a phantasy of committing suicide and of how that would make her suffer. He was attracted to a young woman who was socially superior to him. He obtained £60 from his mother by telling her it was required to patent an invention of his; the money was spent on presents and outings for the young woman.

In June, 1939, he volunteered for the Royal Navy, but was found medically unfit; he was very depressed about this. In 1940 he volunteered for the Merchant Navy, concealing his previous unfitness. He sailed as a junior engineer and the ship was attacked from the air. The patient acted as a gunner, and another junior officer, to whom he had formed an attachment, was killed before his eyes. On getting home he was ill for two months with nervous symptoms, especially fear of aeroplanes. Later his convoy was attacked by submarines. The patient admired his Captain, who had won the O.B.E. for ramming a U-boat; his girl-friend's brother had been decorated in the Army. He decided to buy an O.B.E. ribbon on landing, to bolster up his courage and to compensate for his stammer. He wore this ribbon for eight months, telling one of two stories: (1) That the ship was torpedoed, all the crew were struggling in the sea, and he supported his exhausted captain in the water for several hours; (2) that in a convoy to Russia the ship was abandoned after an attack, but the captain and he took the initiative in returning to the ship and salvaging it. He said he nearly believed the stories himself. While wearing the ribbon he felt more confident and had less stammer and thought people respected him more. After his next voyage he also wore the ribbon of the George Cross. At this time he felt unable to continue the association with his girl friend, and arranged for friends to tell her that he was interested in another girl. He was arrested for wearing the decorations without right, was fined £3, and claims an amnesia for the three days concerned. On his next voyage he was again upset nervously by air attacks, and on his return had operations for bladder stone and for chronic appendicitis. Again he wore the same two ribbons, was arrested and fined £15. He came for treatment on his own initiative and was very co-operative in an analytic type of treatment. When he heard an aeroplane he had anxiety attacks and visions of the young officer being killed beside him.

Up to September, 1944, he was apparently making good progress in civilian engineering work. He had, however, made a nuisance of himself by making advances to a girl who was already engaged.

Case 6.—A woman, aged 22, was a voluntary patient in West House in 1944. The mother has

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an anxious temperament and has recently had asthma; a maternal great-uncle was asthmatic. There is a strong military tradition in the family. Seventeen relations or relations by marriage have served in the Forces—mostly as N.C.Os., a few as commissioned officers. Of these three were killed in this or the last war, and seven in all were regular soldiers. The father volunteered in the last war and had fighting service in France for nearly three years; he continued in the Regular Army until January, 1939, was recalled at the outbreak of war and is still serving as a sergeant-major. The brother has been ten years in the Regular Army, and served in France and in Burma. Almost all her life the patient lived in married quarters in barracks, but she did not play at soldiers, with guns, etc.

Owing to rickets she did not walk till aged 3½, but there is no residual deformity and her intelligence is normal. She was always solitary, unconfiding, quick-tempered, vain, and fond of expensive clothes. In childhood she was afraid of confined spaces, of the dark, of deep water and of diseases and her appetite was capricious. At 13 she ran away from home and three days later was found in a friend's house. She never applied herself at school, and insisted on leaving as soon as she was 14. She had several jobs, none of which she kept long. At times she suffered from angioneurotic oedema.

The patient joined the Women's Auxiliary Air Force as a volunteer in June, 1940, on her own initiative because she felt restless and wished to get away from home. She was in many air-raids, and volunteered for fire-fighting rather than go down to the shelters, where she had claustrophobia. From this time she frequently attended the Medical Officer with minor functional complaints. At one stage she wore the shoulder-badges of a wireless operator, although she had failed to complete the course. Posted to another aerodrome, she arrived wearing U.S.A. shoulder-flashes; the W.A.A.F. officer was suspicious, but, according to her father, the patient insisted so cogently that she was an American citizen born in New York that her deception was not proved until her papers arrived. She absented herself without leave to escape the consequences, and repeated this offence several times, especially when she did not feel disposed to do her duties. Later she was sent for a Medical Board, and on the way again absconded, having, this time only, an alleged amnesia.

Discharged at the beginning of 1943, she soon stole some clothes from a workmate. She disappeared, and two weeks later was arrested for obtaining hotel accommodation without payment. The Court sent her to a voluntary training home. After some months she ran away. She told a woman in a hotel that she was an Atlantic ferry pilot and could bring this person cosmetics, stockings, etc., from America. The woman gave her money to do so. Arrested again after two weeks for board and lodging fraud and for false registration, she was admitted to West House. She ran away once more, was missing for six weeks, and was again arrested on the usual charge. Fuller details of her escapades are not available, as she tearfully refuses to reveal them.

The patient is a good-looking young woman, with a pleasant manner and a good command of words. She has told both physicians and magistrates that her parents, especially her mother, brought her up unkindly, but we do not believe this. In fact, the patient domineers her mother so much that the latter "will do anything for peace." She threatens to commit more offences if her mother does not buy her lots of clothes, cosmetics and such like.

Case 7.—A woman, aged 22, was in Jordanburn in 1942. There is reason to believe that other members of her family are psychopathic. The patient had sexual relations before she was sixteen and the mother forced a marriage with the man concerned. There were three children. Rows were frequent in the home, and finally the husband left and the patient's mother took charge of the children. She left her own district, masqueraded under a false name, and undoubtedly led an immoral life. After being arrested for theft she was transferred from prison to a municipal hospital with a view to certification as a mental defective. She ran away from the hospital and joined the Women's Auxiliary Territorial Service. In this she proved most unsatisfactory, defaulting frequently and leading an immoral life. She was discharged, and was later found in a stunned condition in the street. Again admitted to a general hospital, she remained there for four months, complaining of vaginal bleeding. She was treated by dilatation and curettage, irradiation of the ovaries, supracervical hysterectomy, and massive doses of vitamin C, before it was discovered that the alleged vaginal bleeding was due to self-inflicted excoriations. She also complained of retention of urine and was catheterized several times, anything from 1 to 30 oz. of urine being obtained. The abdominal distension disappeared under anaesthesia, and it was found that she went to the water closet unobserved or micturated into her hot water bottle.

Transferred to Jordanburn, she tried to malinger as before. She made open advances to male patients and claimed that she was pregnant. Her account of her past life varied from day to day. She was totally lacking in insight or appreciation of the seriousness of her behaviour and showed no remorse. She continued to utter numerous fabricated stories. I.Q. on the Terman-Merrill Form L was 89 per cent. While in hospital she made an application to join the W.R.N.S. Transferred to a poorhouse, she soon reappeared at the hospital untidily dressed in an A.T.S. uniform without a cap. She claimed that she had never been discharged from the A.T.S., and that she had returned to the depot and been given the uniform. We learned that she had stolen the uniform, and had committed the same offence several times before.

The patient was arrested and was examined psychiatrically in prison. She told a fantastic

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story of having been married to a high-born foreign officer, who was, however, according to her tale, now serving a prison sentence for assault. She was admitted to a mental hospital under certificates.

Discussion.

The fundamental factor was that each patient suffered from a psychopathic state, as described by Henderson (1939). A similar disorder of behaviour might occur in hypomanic or exalted paranoid reactions, but no instance of this was seen, although the diagnosis of hypomania was at first considered in Case 2. All the patients showed a serious disorder of the personality, existing long before the war, and this personality disorder was the prime cause of that form of abnormal behaviour with which they reacted to the war situation. The purposelessness and futility of this behaviour, to the ordinary observer, and the very serious consequences it had for the patients and for their families, illustrate once again the grave problems of the psychopathic states. For the sake of a false prestige they compromised their own, and sometimes their families' futures. In most of the cases arrest and treatment had no remedial effect, similar behaviour being repeated when opportunity came.

These cases belong to Henderson's " predominantly inadequate " class of psychopathic states, described by him as " almost more consistently abnormal or immoral, more malignantly involved in their individual tendency than the members of the more definitely aggressive group. . . . It is . . . a self-centredness which takes no thought of others, and has for its aim the individual's self-gratification and glorification, irrespective of what consequences may follow. . . . They are both narcissistic and exhibitionistic ; altruism has little or no place, but in their own mild way they take a delight in their morbid fancies in relation to others. . . . Such states of mind exhibit a detachment from reality, an altered consciousness, a form of split-mindedness where attention is difficult to gain, and where phantasy and romance lead up to situations which are more or less obvious over-compensations for the failure to adapt to actual conditions."

From this small series little can be learned about the *general* aetiology of the psychopathic states. In each case there was some family history of psychosomatic, psychopathic or general psychiatric disorders, but not enough to show that the patients' conditions were hereditary, although most were what one calls constitutional.

Some things can be learned about *specific* causes in these cases. The state of the patient's health was important. A history of more physical ill-health than the average was obtained in six of the cases ; and the general physical development was poor in three. One can see here a mechanism on Adlerian lines of over-compensation for physical inferiority. Not only the masquerading, but also many other aspects of the patients' behaviour showed this over-compensation. Six of the cases were medically unfit for military service for either physical or psychiatric reasons—three at the recruiting examination and three after a period of service. All seven patients were of military age. Again we can infer that a sense of inferiority —this time a specific one in relation to their contemporaries who were serving— conditioned the special form of behaviour disorder which they showed.

Only in Case 5 was much information obtained about the patient's phantasy life (and " he nearly believed the stories himself "), but we may assume that in most there was a complicated, unrealistic and wish-fulfilling phantasy system which almost took on the value of reality. Yet it did not entirely do so, which distinguishes these psychopathic states from psychotic conditions. The existence of a phantasy system can be inferred from the persistent and repetitive nature of the disorders—as opposed to the episodic and impulsive acts seen in other psychopathic states.

In Case 1 the patient as a child had an unusual degree of interest in guns ; in Case 2 there was a similar interest in toy soldiers. In most of the other cases there is no information on this point. It is possible that in Cases 1 and 2 there was a connection between the military phantasies of childhood and the later disorders of behaviour.

The social circumstances of the war situation itself probably determined the choice of symptom. Masquerading as a soldier must have been very rare in this

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country before the war, and I, at least, never saw an example then. Similar disorders of behaviour, such as impersonating titled persons, were of course quite common. All the cases in this series were so seriously involved that, apart from the war, they would probably all have exhibited other types of psychopathic behaviour.

The family record of military service was noted in each case except No. 7, although in Case 4 the data on this are incomplete. In five cases relations had served in the last or in this war. The amount of service in the whole group is perhaps not more than that of average families in the population, but one can note some special points. In Case 6 there has been an outstanding family tradition of military service and achievement. In Case 3 the father's success was much greater in military than in civilian life, and the patient greatly admired this success. In Case 2 a brother, whom the patient hero-worshipped, was serving. In Case 4 the younger brother was already an officer, while the patient's civilian career had been one long deception. One may infer that admiration or emulation of the military achievements of other members of the family was another—admittedly superficial—mechanism in these instances.

In conclusion one may repeat that the psychopathic make-up was the fundamental factor in all cases; that a sense of bodily inferiority was probably of considerable importance; and that some superficial reactions to the war situation can be recognized; but there must be other fundamental factors which we do not understand in these cases any more than in the psychopathic states generally.

I thank Prof. D. K. Henderson for his advice on this paper.

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REPORT OF A CASE OF BILATERAL DEGENERATION OF THE GLOBUS PALLIDUS.

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AND

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It is felt that the following case and post-mortem report is of such clinical and pathological interest that it is worth while recording it in its present form. Under existing conditions of service we have been unable to go deeply into the literature concerning such conditions.

Case Report.

Lt. R. F—, R.N.V.R., aged 26, was fit and well until a motor accident on November 26, 1942, when he sustained the following injuries :

(1) Multiple abrasions and minor lacerations of the face.
(2) Small linear laceration of the right upper eyelid.
(3) Subconjunctival haemorrhage of the right eye with no evidence of other damage to the eye.
(4) Fracture of the nose with displacement.
(5) Loosened teeth with the right first incisor broken off and driven back into the gum.
(6) Fracture of the right forearm, with rotation of the fragments.

He was taken to a general hospital, and when examined there was not unconscious and gave no history of loss of consciousness. A general anaesthetic was given and the right forearm manipulated and reduced with a satisfactory result. On November 28 he was thought well enough to transfer a short distance by ambulance to the area orthopaedic centre situated at another general hospital. On arrival at this hospital his condition was quite satisfactory. On November 29 his scalp wound began to bleed and was opened up by Lt.-Col. Armstrong under pentothal anaesthesia. Blood clot was evacuated from the wound, but no definite bleeding vessel was found ; therefore the wound was sutured and dressed. While in the theatre for this operation an examination of the nose was made by the E.N.T. surgeon, who reported as follows :

" There is a fracture of both nasal bones and the nose may be freely moved on the face. Position good and both airways are clear at the moment ; there is therefore no treatment so far as the nose is concerned ; splints are not required. Ears are normal."

The patient was returned to the ward, where he became cyanosed and his pulse rate increased to 140 per minute. He was given oxygen and carbon dioxide, and his jaw pulled well forward. He soon improved, but later in the day his temperature rose to 101·4° F. and he had a rigor.

Lt.-Cmdr. Ayoub examined his eyes on December 1 and reported that their condition was satisfactory. On December 2, under pentothal anaesthesia, Lt.-Col. Armstrong replastered the right forearm, after which the patient's condition appeared to be satisfactory and the wounds were healing in a normal manner until December 7, when it was noticed that he was very restless in bed and appeared to be unable to lie still.

When examined on the morning of December 9 he was found to have definite choreiform movements of both arms and legs, face and body. The tongue was typical of chorea, and a worm-like grip was present in the left hand. Speech was

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affected in so much that it was explosive and not clear, his replies to questions were short, and because of his speech he was unable to carry out a sustained conversation, but mentally he appeared normal at this time. The movements were observed to stop during sleep. An examination of the nervous system showed nothing further abnormal.

The wounds on his lip and the scalp and eye wounds had become septic, and on examination of his throat there were found a few patches of yellow exudate on both tonsils.

A throat swab taken on December 9 showed *Staphylococcus aureus* and haemolytic streptococci, but no diphtheria bacilli or Vincent's organisms. The leucocyte count was 9,500 per c.mm., with a differential count of neutrophils 67 per cent., lymphocytes 29 per cent. and monocytes 4 per cent. The cerebrospinal fluid was also examined and found to be clear, with less than two cells per c.mm., protein 40 mgm. per cent., globulin no excess and sugar normal. Direct smear and culture were negative.

On December 11 his condition was much the same as before, but next day it was thought that he had improved a little and he could control his movements to a certain extent voluntarily. His urine examined on this day was normal.

However, when examined on December 13 his condition was definitely worse; he had generalized, purposeless, jerky, ill-sustained movements, which were most marked in the left arm, which was slightly weak as well. All deep reflexes were exaggerated, the abdominals were present and the plantars were flexor. There were no sensory changes, and no incontinence of urine or faeces. The only other abnormality found was diminished movement of the soft palate. Surg.-Lt.-Cmdr. Davies, R.N.V.R., was asked to see the patient, and he agreed with the diagnosis of chorea, but could not suggest any cause for it.

Next day the patient complained of difficulty with swallowing, and on examining the palate it was found that the movements were spasmodic. His choreiform movements seemed a little better.

On December 15 the ulceration on his lips was definitely worse; he began to complain of cramp-like pain in his legs, and there was slight weakness in his left peroneal muscles. The condition of his palate was the same, the lip ulceration showed a slight tendency towards healing, but the scalp wound was still septic and his left tonsil was covered with a dirty greenish slough, the rest of his throat being mildly inflamed. A specimen of urine tested was normal. A swab from the lip grew diphtheroids and scanty haemolytic *Staphylococcus aureus*, but the throat swab grew morphological K.L.B. The white cell count was 10,800 per c.mm., with 76 per cent. neutrophils, 20 per cent. lymphocytes and 4 per cent. monocytes. No abnormal cells were seen. A further throat swab taken on December 23 again grew morphological K.L.B.

By December 26 the condition of the throat was much improved and the slough had gone, and his scalp and lip wounds were improving. A smear from the scalp wound grew haemolytic *Staphylococcus aureus*, but no diphtheria bacilli. His chorea was, however, getting worse, and on the night of January 1 he was very restless and attempted to get out of bed, talking nonsense all the time; he was also incontinent of urine. On January 3 Lt.-Cmdr. Ayoub examined his eyes, and reported that the right pupil was larger than the left, and that there was slight fluffiness of the right disc margin. He thought the cause was a mid-brain lesion. Major Lloyd, the area psychiatrist, also examined the patient and agreed with the diagnosis of chorea, which was associated with marked hallucinations, but because of the patient's condition he was unable to make any detailed psychiatric examination.

On January 4 Brigadier James saw the patient, but was unable to shed any further light on the case. A white cell count done on this day showed 11,500 cells per c.mm., with 75 per cent. neutrophils, 3 per cent. basophils, 18 per cent. lymphocytes and 4 per cent. monocytes. All the cells appeared normal.

Lumbar puncture was performed on January 5, but the C.S.F. was mixed with blood due to trauma. A throat swab grew haemolytic *Staphylococcus aureus*, but no diphtheria organisms.

On January 6 it was reported that he had not slept at all well during the night, going to sleep for only short periods at a time, during which periods his choreiform movements stopped. He had been definitely more noisy and had talked a lot of

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nonsense, sometimes rambling on about his accident, or pretending to be driving a motor car or piloting an aeroplane. He was showing definite signs of exhaustion, and his mental state was getting worse; it was getting very difficult to get him to answer simple questions, and feeding was becoming a problem. On examination there were still the same typical choreiform movements of the face, arms, legs and body, the tongue movements were typical, as also was his grip, but the power in his limbs was definitely decreasing. All deep reflexes were present, and no gross lesion of the cranial nerves could be found. The abdominal reflexes were absent. His legs were wasted, and his feet had taken up a position of extension and inversion; there was no true paresis or hypertonia of the ankles, but movements were weak. Plantars were flexor. He had now become incontinent of both urine and faeces.

On January 10 he seemed a little quieter and more sensible, and the chorea was not quite so violent. The heart sounds were tic-tac in character, with a short sharp aortic second sound. Next day he was worse again, and at times he was confused; he had no idea about the date or the time of day, and had only a vague idea of how long he had been in hospital, but later on he became quite rational. At times he would become rather violent and try to hit people, but this seemed to be due to an ungovernable emotion of dislike for certain people; later on he would remember all about it and be sorry for what he had done. His movements were worse, but there was no change in the physical signs in the nervous system.

Lt.-Cmdr. Ayoub again examined his eyes and reported that there was no choking of the discs, but that they were not as distinct as possible owing to the mucoid corneal covering. Another lumbar puncture was carried out, the fluid being below normal pressure and the Queckenstedt normal. There were 4 lymphocytes and 18 red blood cells per c.mm., protein 70 mgm., globulin slight excess and sugar normal. Culture and smear were negative. The increase in protein and globulin was probably due to the previous lumbar puncture, when pure blood had been obtained.

By January 14 his movements were worse; he did not recognize those who were looking after him, and he appeared unable to speak coherently. From this date onwards he became steadily worse, becoming completely disorientated and having great difficulty in swallowing, not apparently due, however, to any complication associated with his diphtheria infection; his choreiform movements remained much the same in degree.

On January 20 he developed a cough without any very definite gross physical signs in the lungs, and he died suddenly on January 22.

A lumbar puncture had been performed on January 16, when the cerebrospinal fluid was found to be under normal pressure and showed 8 lymphocytes per c.mm., with 40 mgm. of protein and no excess of globulin, the sugar being within normal limits. Blood urea done on the same day was 96 mgm. per 100 c.c., with a normal urine.

During the whole course of the illness the temperature did not rise above 99° F. except after the operation on November 29 and just before his death.

Radiographs of the skull and right forearm had been taken on the day following his accident and showed no fracture of the skull, the radius and ulna being fractured at the junction of the middle and upper thirds.

One attempt was made to find out something about this officer's family history, but apart from hearsay evidence that there was no family history of chorea or fits or mental defect we were able to get nothing definite. He himself was regarded as somewhat of a clever eccentric before his accident.

The treatment of this case was from the outset somewhat empirical, as a definite diagnosis beyond chorea could not be made. The surgical treatment consisted of the usual routine measures for such injuries, and apart from the occurrence of sepsis, which was dealt with, seemed satisfactory and his wounds were healed at the time of his death.

From the point of view of medical treatment the exhibition of aspirin or sodium salicylate had little effect on the condition. Luminal was of no use at all; large doses of medinal did seem to help a little, but paraldehyde was the best sedative tried. Morphia had little beneficial effect. He was given 80,000 units of anti-diphtheritic serum intramuscularly on December 23, and his throat seemed to improve in a normal manner following this injection. 23 gm. of sulphanilamide

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was also given in the hope of helping the wound sepsis, but the whole course of the disease was one of progress downwards to death.

Autopsy (10 hours post mortem).

The body was wasted, but otherwise well developed. The fracture of the right arm had united and the injuries of the face had healed completely.

The nasopharynx contained a little muco-purulent exudate. The tonsils were large and cryptic, but the mucous membrane appeared normal. The right lung weighed 570 gm. and the left lung 455 gm. Both showed a moderate degree of congestion, oedema and hypostatic lobular pneumonic consolidation. The heart weighed 255 gm., and apart from a moderate degree of right-sided dilatation appeared normal. The liver weighed 2,005 gm. It was enlarged, dark reddish-brown in colour and the cut surfaces were bloody, but otherwise normal in appearance. The other abdominal viscera appeared normal.

There was no evidence of any injury to the skull. There was an apparent increase in cerebrospinal fluid, and the meningeal vessels were congested. The external surfaces of the brain appeared normal. The cut surfaces showed a moderate degree of generalized vascular congestion, and an otherwise normal appearance everywhere, except for the globus pallidus on each side, where very striking macroscopic lesions were found (Fig. 1). These structures were soft, buff-coloured, porous and collapsed. On each side the entire structure was involved and was clearly demarcated from the surrounding tissues, which appeared free from disease. The latter, which include the caudate nucleus, putamen, optic thalamus and internal and external capsules, were of normal colour and consistency. The white bands of the medullary laminae which divide the globus pallidus in two appeared broader than normal—an appearance which was probably only relative, due to collapse of both zones of the globus pallidus. The medulla oblongata and spinal cord appeared normal.

Microscopic Examination.

There was some fragmentation of muscle fibres in the heart. The kidneys showed vascular congestion, and rather marked cloudy swelling of cells lining the convoluted tubules. In the liver there was a moderate degree of generalized congestion in the sinusoids and a little fatty metamorphosis in the parenchymatous cells, particularly in the central zones of liver lobules.

Sections from the central nervous system included the globus pallidus, putamen, optic thalamus, internal capsule, caudate nucleus, substantia nigra, red nucleus and subthalamic regions, motor cortex, floor of the fourth ventricle and medulla oblongata. They were stained with Ehrlich's haematoxylin and eosin and Pal's modification of Weigert's method for myelin sheaths. Myelin degeneration was almost complete in the globus pallidus on each side. The normal structure was replaced by a loose reticulum, in which there were many scattered compound granular macrophage cells. These were somewhat more abundant around the blood vessels, where they formed rather ill-defined perivascular cuffs. The only other type of cell seen was a small cell with a dark staining nucleus and scanty basophilic cytoplasm. These were not numerous, and were scattered diffusely throughout the lesion. Only a few nerve cells were present. They were at the edge of the lesion, and showed varying degrees of degeneration from mere swelling of the cell to chromatolysis. No red blood cells or pigment was found to suggest that any previous haemorrhage had occurred. The edge of the lesion was well demarcated, and the surrounding brain tissue appeared unaffected except for a slight apparent increase in small round-cells in the zone of demarcation.

Weigert-Pal stained sections failed to reveal any lesion other than that described in the globus pallidus.

Service conditions made it impossible to carry out any further histological investigation of the tracts to and from the globus pallidus.

Comment.

This case is of unusual interest, because it showed a degenerative lesion which was apparently confined purely to the globus pallidus on each side and the symptoms

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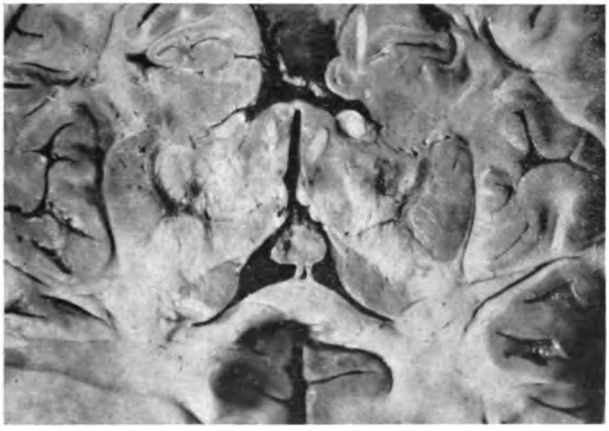

FIG. 1.—Coronal section of the frontal portion of the cerebral hemispheres. Both portions of the globus pallidus on each side are degenerated and collapsed. The medullary laminae and putamen appear normal.

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were those of a progressive type of chorea. No athetoid movements were observed. No liver lesions suggestive of those found in Kinnier Wilson's disease were seen.

From the post-mortem findings there is nothing to suggest that fat embolism, haemorrhage or any other vascular disease had a place in the aetiology. Microscopy indicated that the lesion was one of pure degeneration.

It would appear to us that the most likely aetiological factors are either trauma at the time of his accident or the anoxaemia which followed his first pentothal anaesthetic. In either case the addition of some constitutional defect of the nervous tissue concerned may have been an additional factor.

Summary.

(1) A case is described in which bilateral degeneration of the globus pallidus is accompanied by the clinical picture of severe chorea.

(2) The possible aetiology is shortly commented on.

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EXPERIENCE WITH A SIMPLIFIED LIGHTWEIGHT APPARATUS FOR THE ELECTRICAL INDUCTION OF CONVULSIONS.

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[Received December 20, 1944.]

WHATEVER the ultimate decision on the permanence of the results of electric convulsive therapy, there can be no doubt as to the present widespread popularity of this treatment in psychiatry. To meet the big demand there have become available in the last few years a number of different convulsant machines, most of which are fairly efficient, but not one being free from defects when exposed to the test of practical application. Some are too heavy and cumbersome, most are liable to minor technical breakdowns, which are the source of much annoyance because they disrupt the hospital routine, one has a faulty time switch which has caused the writer a considerable amount of anxiety when it jammed and allowed the current to flow for about 5 seconds—the patient developed a prolonged period of post-convulsive apnoea, but fortunately came round eventually and suffered no lasting ill-effects. Most machines incorporate one or more instruments to measure the current or the patient's resistance. Neymann *et al.* have shown the inaccuracy of such simple instruments, and it is doubtful whether they serve any useful purpose. The ammeters are relics of the early days of this treatment, when we were not sure about the safety range of the current, and they were included in the circuit as an extra safeguard. Our experience over the last five years has taught us what currents can be safely used, and an efficient convulsant machine can now be designed whose maximum voltage and maximum time give an output which is well within the limits of safety. A knowledge of the current used is of interest while the machine is undergoing the initial tests, but once this period is over its evaluation, even by an accurate method, is of little academic interest, and a waste of time from the point of view of the practical psychiatrist. The resistance measurements, too, are unnecessary in practice. They were originally made in the hope that they would enable the dosage to be correctly adjusted so as always to ensure a convulsion. But we now know, as Grey Walter has recently pointed out, that the convulsive threshold varies from individual to individual by as much as 1,000 per cent., and since it is a value which can only be found by a method of trial and error, the resistance instruments are of little use. Moreover, no great harm is done if an underdose actually is given—all that happens is that the patient has a temporary period of unconsciousness, and after a short interval a higher dose can be given, which will produce the desired convulsion. It is true, of course, as Kalinowsky (1939) said, that resistance measurements enable one to ensure that the electrodes are making good contact with the patient's skin, but one feels that this is an elaborate and costly method of doing something which could be more easily and quickly accomplished by training the nursing staff always to clean the patient's skin thoroughly before applying the dampened electrodes.

These ammeters and circuits for measuring resistance add considerably to the weight, size and cost of the machines, and being delicate instruments, are liable to technical breakdown when subjected to the rough handling of normal psychiatric practice.

It is felt that there is a need for a convulsant apparatus which is free from the above faults; which is light in weight, so that it can be moved about easily without being damaged; which is simple in construction, so that there is less chance of

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technical breakdown; which is reliable in performance; and which has an adequate range of voltage and time, whilst being perfectly safe for patient and operator.

Such a machine is described below. It has been built to my design by Mr. E. L. Turner, a Swansea radio engineer, to whom a good deal of the credit is due for its technical excellence, and especially for its efficient and reliable time switch. It has been in constant use in the in-patient and out-patient departments of this hospital for six months, and details will be given of its satisfactory performance.

Description of the Apparatus.

The machine derives its power from the A.C. mains. Its chief features consist of a transformer to take the voltage down by 5-volt steps through a range of 35 to 135 volts, and an electronic type time switch, which can be set to limit the flow of current from 0·1 second to 0·5 second.

A mains switch is included for connecting the apparatus to the mains supply, and when the current is flowing it lights up a red pilot lamp. The current is taken to the primary coil of the transformer, and the time switch is included in the secondary coil circuit, so that there is no time lag due to current surge when it is switched on.

The time switch, which is the only complicated part of the machine, is constructed on the principle of causing a condenser to charge up, and during this process a relay is operated which closes the main circuit, thus allowing the transformer current to pass across the electrodes. This process takes place when the shock switch is operated. When the condenser is fully charged it discharges through a valve and the relay reopens the main circuit. The time switch is so designed that it can only operate once for each closure of the shock switch. The drawback of such a switch is that it incorporates a delicate valve, which wears down after continued use, and is always liable to be broken if the machine is roughly handled. After much experimenting a circuit has been chosen which allows the valve to be replaced by a resistance giving the same impedance, with the result that the switch is now free from all avoidable defects, and its performance is not altered by ordinary rough usage or by the passage of time.

While the current is flowing across the electrodes a yellow pilot lamp is lighted up, and this is a visual indication that the shock is being given. The electrodes can be cut off from the rest of the machine by a special safety switch, and this prevents any accidental shock to the nursing staff due to a mechanical jolt causing a closure of the time switch relay while moving the apparatus from patient to patient.

Special care has been paid to the design of the electrodes and their leads, as in some machines it is technical breakdowns here which are so common and so annoying in practice. It has been found that the best type is the simplest: A length of flex leading to a pair of thin malleable aluminium electrodes 3 in. by 2 in. in size. The join between wire and electrode is a usual source of trouble, because the mechanical stress and the corrosive action of the saline cause it to "eat through" after a month or two's use. The solution has been found to be to do away with complicated soldered joints, and instead to puncture a hole near the edge of the electrode with a penknife, put the bared end of the flex through and twist it round. This makes a firm joint, and when it eventually eats through another one can be made in a couple of minutes by puncturing further round the edge. Lint envelopes soaked in saline are placed over the electrodes, and an easily adjustable headband, made of canvas covered with waterproof cloth and closing by means of a quick action snap fastener, holds them in position on the patient's head.

The whole apparatus is housed in a strong wooden box measuring 19 by 10 by 7 in., and weighs only 22 lb. Its weight could be reduced still further by using lightweight components, which have not been obtainable locally because of wartime difficulties.

Practical Experience with the Apparatus.

The electric convulsant apparatus has been in use on the male wards of this hospital for six months. During this period 39 patients have been under treatment and a total of 515 convulsions has been given.

Nineteen patients were schizophrenics, and they have been given a total of

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236 convulsions. They were mostly chronic in-patients of poor prognosis and good physical condition, who were used as subjects during the preliminary trials of the machine. Five of them were much improved, though not well enough to be discharged from hospital, three were improved, and eleven showed no change as a result of the treatment.

Four patients were suffering from involutional melancholia and they were given a total of 34 convulsions. They have all recovered, and were considered fit for discharge from hospital.

Sixteen patients are suffering from epilepsy, and they have been given a total of 245 convulsions. The therapeutic effect of E.C.T. in these cases is being investigated, and the results have so far been very promising. The rationale of this paradoxical treatment is based on the theory that the essence of epilepsy lies in a cerebral dysrhythmia, which leads to the occasional accumulation of excessive concentrations of " energy," and that the fits are Nature's way of dissipating these.

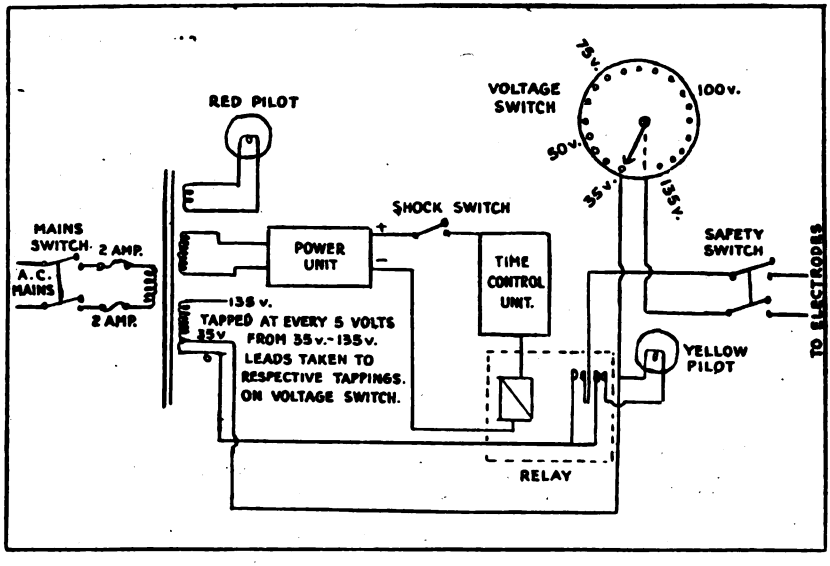

FIG. 1.—Skeleton diagram of the circuit.

The aim of the treatment is to replace the spontaneous epileptic fits, which may take place at awkward or dangerous times, by convulsions which are electrically induced under controlled conditions of time and place. A preliminary paper on this subject is in process of preparation, and will shortly be ready for publication.

The adequacy of the range of voltage and time in the instrument was shown by the fact that on no occasion was it found impossible to induce a convulsion among the schizophrenics and melancholics. The epileptics represented an unusual task for an E.C.T. machine—they were mostly being treated with large doses of anti-convulsant drugs, including epanutin, and Hemphill and Grey Walter have shown that these raise the convulsion threshold to E.C.T. very markedly. Despite this, a convulsion was induced on all but eleven occasions, which represents a failure rate of 5 per cent. During the last couple of months there have been no failures even in this group since a technique has been evolved of artificially increasing the effect of the machine. It has been found that only certain patients are liable to be " non-convulsers " when given 135 volts for 0·5 seconds. In these cases, if the convulsion does not start within 3 seconds after giving the shock, another similar shock is immediately given. This procedure has been invariably followed by the induction of a convulsion. The explanation of this phenomenon was thought to be that the first shock lowers the patient's resistance, so that the same voltage, when repeated, gives a current big enough to exceed the convulsive threshold.

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TABLE I.—*Table Showing Typical Ammeter Readings during the Procedure of "Repetition of the Dose."*

Patient.	Diagnosis.	Shock.	Interval.	Voltage.	Time in seconds.	Result.	Current in amperes.
W. M—	Epilepsy	First	—	135	0·25	Preconvulsion	0·75
		Second	3 secs.	135	0·25	Convulsion	0·75
C. A—	,,	First	—	135	0·30	Preconvulsion	0·80
		Second	3 secs.	135	0·30	Convulsion	0·80
B. B—	Schizophrenia	First	—	70	0·25	Preconvulsion	0·40
		Second	3 secs.	70	0·25	Convulsion	0·40
J. H—	Epilepsy	First	—	135	0·40	Preconvulsion	1·20
		Second	3 secs.	135	0·40	Convulsion	1·20
J. C—	Melancholia	First	—	90	0·25	Preconvulsion	0·50
		Second	3 secs.	90	0·25	Convulsion	0·50
R. N. S—	Epilepsy	First	—	135	0·25	Preconvulsion	0·65
		Second	3 secs.	135	0·25	,,	0·65
		Third	5 min.	135	0·50	,,	0·65
		Fourth	3 secs.	135	0·50	Convulsion	0·65

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Measurements of the current however render this hypothesis untenable, because it has been found that the current flowing during the second shock is always the same as the first one. This is illustrated very well by Table I, which is a table of a few typical results. It is therefore suggested that the reason for the more powerful effect of the second shock is that the first one causes some temporary irritation of the cortical cells and a consequent lowering of the convulsive threshold. The name " repetition of the dose " has been given to this procedure, and it seems worthy of further investigation.

The fact that no readings of the patients' resistance were taken did not affect the practical results. In order to illustrate this point, the number of occasions was counted on which a wrong estimate of dosage was made, involving the necessity of giving a further shock in order to obtain a convulsion. This happened in 52 cases, i.e. in 11 per cent. of the total; which means that in 89 cases out of 100 a correct estimate was made from a knowledge of the machine and the patient, so that a convulsion was produced at the first attempt. It is doubtful whether calculations based on a knowledge of the patients' resistance would produce better results than this.

It was found in practice that 90 volts for 0·3 second was a reasonable initial dose among the schizophrenics and melancholics, though the average convulsant dose in this group was found to be 100 volts for 0·35 second. Among the epileptics, who were under the influence of epanutin and luminal, the average dose was 120 volts for 0·4 second, and eight patients needed the full dose of 135 volts for 0·5 second to give convulsion. It seems therefore that the instrument might be improved by altering the resistances in the time-switch to give a higher time ceiling —possibly up to 1 second. This would still be within the margin of safety— Neyman *et al.* use a machine which goes up to 3·9 seconds and claim they have had no harmful results; they frequently use doses of 130 volts for 1·2 seconds. The technique of " repetition of the dose," as described above, gives another method of achieving the desired results.

The output of the apparatus in terms of current is of some interest. This has been measured during the preliminary test period by means of a sensitive ammeter reading up to 1·75 amps. It was found that the current varied between 0·30 amp. and 1·30 amps., and this compares favourably with the output of other machines. Neymann *et al.* from their own experience and after reviewing the literature give 2·00 amps. as a safe ceiling value. So that the present machine is working well within the limits of safety.

The light weight of the machine and its handy size made it very easy to use. This was especially noticeable when large numbers of patients had to be treated at the same session. The investigation on the epileptics has thrown a heavy strain on the apparatus. It has not been unusual to have to treat as many as 20 patients at a session, and it was surprising how quickly this could be done. A ward was chosen in which there were seven adjacent side rooms. The better types of patient and the timorous ones were put in these, and the rest were laid in a row on beds in the main dormitory and screened off from each other. The machine was placed on a ward trolley and wheeled from patient to patient. It was found that one medical officer assisted by six or seven nurses could complete the whole treatment inside 30 minutes, and this without any hurry or commotion, and despite the fact that all non-epileptics were held in hyperextension to prevent vertebral fracture.

The machine has stood up very well to the heavy work of its six months' trial. Its performance is exactly the same now as when it was first used, and experience has shown that its output has been maintained without variation. There has been only one technical breakdown during the period, and that occurred in the first two weeks. It was found to be due to the inclusion in the time switch of a faulty resistance in which the carbon rod was fractured and occasionally broke contact. This casts no reflection of course on the design or construction of the machine, but on the unreliability of wartime components. It was interesting that although it was the time switch, the most critical part of the apparatus, which broke down, this was not associated with any danger to the patient. The result was that the switch merely reverted to its basic periodicity of 0·1 second, and the machine gave a current for 0·1 second only whenever the shock switch was closed.

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Conclusion.

The practical tests over a six months' period involving constant use at high pressure have shown that this apparatus is reliable, safe, and simple to handle, and that it is quite efficient as regards the induction of convulsions in the usual type of psychiatric case. For work with epileptics, who are under the influence of anti-convulsant drugs, it might be improved by raising the time-switch ceiling to 1 second.

Summary.

(1) Criticism is directed against the design and construction of electric convulsant machines at present available.

(2) An improved apparatus is described, the principles of its design being simplicity, reliability, adequate range of voltage and time, and safety for patient and operator.

(3) The results of a six months' trial of this apparatus are described. During this time 39 patients have been given a total of 515 convulsions. The performance of the machine has been eminently satisfactory.

(4) Mention is made of the use of this therapy in the treatment of epilepsy, which introduces special demands on the machine.

My best thanks are due to Mr. E. L. Turner for his excellent workmanship in constructing the machine; to Prof. R. O. Kapp, Professor of Electrical Engineering of London University, for his advice and criticism of the circuit; Dr. N. Moulson, Medical Superintendent, for his help and for permission to use the apparatus in this hospital; Miss L. Davies, Mr. W. Place and the male staff for their invaluable co-operation.

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THE TECHNIQUE OF CHILD PSYCHIATRY.*

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I ONCE knew a child psychiatrist who had two treatments: Boy Scouts for all symptoms except enuresis, for which he prescribed Sea Scouts; but that was before the war, when we had a seaboard.

There is great satisfaction to the human mind in reducing multiplicity to unity, diversity to simplicity, but this exercise can be carried too far, especially in dealing with such a complex creature as the child. In contrast there is the school of thought which believes in intensive analytic treatment, four to five sessions a week, for every child. How can one steer a middle course in a modern Child Guidance Clinic where numbers must be dealt with, without the sacrifice of the deeper approach, where short and long treatments must be fitted in, where diagnosis and consultations are essential, yet *treatment* must always be one of the fundamental aims?

The choice of treatment as to its probable duration and its type, for example deeper or more superficial methods, depends on—

(1) The diagnosis.

(2) The intelligence and insight of the child; intelligence may be high and insight poor; this quality of insight is just as variable in the child as in the adult.

(3) The degree of innate temperamental stability.

If longer and more intensive methods are reserved for a proportion of cases on this basis of selection, then it is possible even in a busy Clinic to make deeper analytic treatment an integral part of one's therapy for such children as need it and will benefit by it: for example, in obsessional and some anxiety states, withdrawn and depressive conditions and certain schizoid and characterological disorders. The deeper approach is not so much a question of time as of orientation, and with the collaboration of the experienced psychiatric social worker, treatments which aim at the exploration of the unconscious can be carried through successfully even with once-weekly visits.

The constitutionally unstable child with poor integrative potentialities is often difficult to recognize, and more so in the child than in the adult. Instability of course is a matter of degree. We need many more long-term studies of the psychopathology of such children, preferably into adult life, before we can make worthwhile prognoses or decide with any certainty the best type of treatment for them; but in my opinion these children on the whole do better with reinforcement of the ego than exploration of the id, and their elimination from the group for deeper treatment does relieve the congestion of the waiting list.

The assessment of emotional instability is one rarely missed by the mental hospital psychiatrist; it is not always believed in by the Harley Street analyst whose experience has not been in numbers. For that and other reasons, too, it seems important that the child psychiatrist should always base his training on a study of the fully developed psychoses in a Mental Hospital atmosphere. He learns from this experience to look for a continuity in the clinical expression of similar states in the child and the adult. He asks, for example, what is the connecting link between the depersonalization of the adult depressive and the unreality sensations and disturbances of body image of the child, expressed in the "funny feelings" of the expanding and contracting type in the "body thinking," kinaesthetic child, or in the mental sphere in persistent obsessive ruminations, such as I found some years ago in a boy of 12 who was constantly haunted by a sense of

* A paper read at the meeting of the Royal Medico-Psychological Association, held on May 24, 1944, at 11, Chandos Street, London, W. 1.

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dissociation, and preoccupied with the recurrent question as he looked in the mirror, "Who am I?" Much of his symptomatology had a depressive colouring.

Let it be clear, however, that experience amongst adult psychotics and neurotics, however enrichening, does not equip the psychiatrist to do child work; this is a specialty in itself, and requires intensive study of child psychopathology as well as an acquaintance with the normal developmental phases of childhood.

Therapy makes use of suggestion, persuasion, re-education, catharsis; all the shorter methods as well as deep and modified analysis. In placing the accent on deeper treatment in this paper, there is no intention of discrediting shorter methods nor environmental modifications in either Clinic or private work. Another factor favours the deeper orientation in child work, and that is the predominance of fantasy in the child's life. Fantasy in children is always so vivid and lively and accessible that whatever the type of treatment or choice of materials used, the therapist must be prepared for sudden incursions into the unconscious, and not be dismayed at the rapidity with which the child runs from one medium to another and from conscious to unconscious spheres, nor at his apparent disregard for direct questions, which is not always resistance, but often the child's more circuitous route to his central theme. For example:

Richard, aged 8. When the psychiatrist mentioned his misdemeanours, stealing, he took no apparent notice, but drew a tank—a British tank he said—with great care and absorption. He then camouflaged it with colours, and as the psychiatrist went on talking he covered it with swastikas and shouted triumphantly, "Ha! that will fool the Germans." I suggested that he was fooling me and perhaps himself too. He looked at me directly then, and said, "It's not the stealing that makes me frightened; but I have to go to boarding school, and what I'm really frightened of is that Mummie may be killed in an air raid and I won't be with her." In other words there is an element of deep treatment in all therapy in the child.

Now what is meant by *treatment* in the child? What are the methods by which the psychiatrist studies and treats the child's personality problems and behaviour disorders?

The child, like the adult, can be studied from two points of view:

(1) Objectively. His demeanour, manner (children are more natural and less conventional in these expressions of their personality than adults, therefore they show more, yet paradoxically hide more), his movements, style of talk, gesture or absence of it, gait, pitch of voice. One boy, for example, spoke in a gruff, muffled voice, saying, "I make it like that so you won't catch what I say." Will he remove his top coat, muffler and pixie-cap, or is he like some adults who sit gloved the first half-dozen interviews? Is he stilted and over-controlled? Is his apparently spontaneous but diffuse talk a screen to protect deeper feelings? Will he look one in the eye or does he evade a direct glance? Is the poverty of interest in toys due to depression and apathy, or to anxious inhibition?

Apart from noting general behaviour, occasional remarks and comments on either significant details of behaviour or characteristic symptoms often call forth replies of astonishing insight from the child, valuable in both diagnosis and planning of treatment, and in the spotting of major mechanisms. Malcolm as an example of this showed a rapid maniacal output of vivid talk, fluent, exact and expressive. I suggested when he paused for breath that he might stop talking for a while. He held his head listening for a minute, then said almost in tears, "I have to go into silence at school; I don't like it; it's like a silent tunnel with demons (I spell it 'dimons' so as not to be so nasty) ready to pop out." He was a boy full of neologisms. He looked afraid and said, "I don't like flatness, empty spaces or silence, it's then I feel I have offended people." This is an interesting commentary on hypomanic talk as a defence against depression, guilt and punishment, and aloneness. When I suggested bi-weekly interviews, he said, "Oh no, if I did you'd run me down and there would be nothing left to talk about."

Then there were two little boys of 5. When the psychiatrist mentioned dreams, one closed his eyes tight as an immediate response and said, "When I dream nasty dreams, I shut my eyes tight, like this, then I can't see them." He was a big, masculine, robust, realistic child. The other, a gentle, slim, silky-haired, imaginative child, responded to the same inquiry by opening his eyes wide. When I said, "Why do you do that?" he replied, "When I dream I open my eyes big and look hard

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at the place between the blackout, then I keep awake and the lions go away." He was more afraid of his fantasy than of outer fears, and preferred the dark and its horrors to the imagery of his lively little mind. One knew that the first little boy would play out his problem with objects; the second was more likely to choose fantasy and dramatic play.

A description of outer behaviour, however, divorced from the underlying psychopathology tends to be merely photographic; it is of little value alone in promoting the understanding of mental processes. Perhaps this aspect is overstressed by the psychiatrist without analytic training, but understressed by the lay therapist. To deepen and give more value to the meaning of outer demeanour and characteristic symptoms, one must relate them throughout treatment to both the structure of the general personality and the function of the psycho-pathological personality, which involves a study of the subjective aspects of the mind of the patient.

(2) How is this subjective orientation cultivated in the case of the child? This is a large subject, and it will be difficult for me not to lose myself in diversity at the expense of unity and simplicity.

The mind content is explored by many methods in modern treatment, the chief of which are talk, the investigation of dreams, drawings (a prolific source of information deserving of a paper in themselves), play with toys and materials of many kinds including sand and water, dolls and dolls' houses, plasticine, building blocks, guns, soldiers; and also fantasy and dramatic play which I personally find effective in therapy and fascinating as a study.

It should be emphasized here that the therapist should be conversant with all methods of treatment, and not confine himself to any one medium. There seems to be an odd belief prevalent that the doctor treats only older children through talk, and the "play-therapist," so-called, only toddlers through play treatment, and even that often restricted to a standardized type of material. Play is, in my opinion, part of every modern therapist's technique, and should be studied by everyone intending to do child work, otherwise he is likely to find the child under nine a closed book; but he should not concentrate on play to the neglect of that other very human medium of talk.

Here it is opportune to outline a few cases illustrating different approaches, beginning with that of talk. Talk with children to my mind should always be indirect and tentative, especially with suspicious or withdrawn children, and particularly in court cases or sexual offences. One never sits with paper on the desk and pen in hand "taking out a case history." The conversation darts rapidly back and forth from realism to fantasy, and one must be prepared to pick up the tempo from the child. I myself always put pencils and scribbling paper handy, as few children or young adolescents can sustain a conversation without supplementary aids, and drawings often reveal at the same time the undercurrent of the unconscious.

James was a case in point. He was a tall slouching lad of 12 who had suffered from faecal incontinence nightly since the age of 6 and intermittently by day; before that he was constipated. From 3 months to 4 years of age he was treated steadily with laxatives, suppositories, and later daily enemas by a visiting nurse. At school he is solitary and shunned by his companions. At home the family find him affectionate on the whole, but at times obstinate and bad-tempered, especially with his father. He is a restless sleeper; is the youngest of four with a big gap between him and the next child. Both parents had wanted him to be a girl.

He had been the round of the hospitals, where everything had been done from an EEG to a circumcision; every known laboratory test had been carried out, but no one had thought fit to explore his mind or his talk, which as later interviews proved, came readily from his rather facile tongue.

James was a naïve, ingenuous boy of poor intelligence (I.Q. only 76), so that some reservations as to his treatability had to be made. The first interview, however, produced many memories of his fancied ill-health and fears of a hypochondriacal nature, for example of being about to die when he was small—"They bathed me in olive oil to make me stronger; I was fed on Horlicks, Ovaltine and butter; the doctor made me crawl on the bare earth and in the muck with only a napkin on to make me grow up healthy." He remembered the suppositories, his interpretation being, "They used to bottle me up, but it was no good."

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When sex knowledge was mentioned he looked coy and said, " I'm far too young to know about those things." With encouragement, however, he produced a wealth of fantasy centering round anal birth, in which he still believed. When told the facts of birth and that " only ladies could have babies " he looked relieved, and then recalled a 6-year memory of wondering whether he had a baby inside him and fears of producing it in the lavatory. " I felt kind of funny but cruel thinking of it going down the sewage pipe and being drowned." He drew this obligingly and many similar drawings of a crude, expressive, realistic nature.

He then disclosed he would like to be a girl and have a baby of his own ; whenever he had a stomach-ache he imagined there was one inside him. He added that his Dad had wanted him to be a girl.

Another theory of birth was the Caesarian, and that fathers kill mothers by " cutting their tummies open " when they have babies. This had added further conflict and fears of losing his mother should she become pregnant, with increased hostility against his father. He produced a spate of drawings as he talked, all of " innards," gastric, intestinal and reproductive, illustrating his prolific fantasies and fears. Each week some of his talk centred round reproduction, cats having kittens, twins, triplets, theories of the navel (about which piece of anatomy most children are very curious), fresh theories of birth, and elaborations of his former belief in anal birth.

During treatment the incontinence gradually lessened and James became less hypochondriacal ; his interest shifted away from bodily fantasy to games and school friends. He no longer wished to be a girl, and it was a great day when he was promoted to long trousers. At the end of six months the symptoms completely cleared, with no recurrence in two years.

His symptom may be interpreted as a fixation at the anal-erotic level, or in Adlerian terms one might say his power drive was deviated into his viscera, with invalidism and constant maternal attention to compensate for his lack of masculinity. The feature of his treatment was his easy talk and rich fantasy which, however, was entirely self-centred and hypochrondriacal in content ; one expects this type of fantasy to diminish in treatment as this boy has little true imagination, and this did eventuate. Once or twice he played with the sand-tray, but his treatment was mainly through talk, drawings and paintings.

The progress of this case is an argument against Professor Valentine's theory in his recent book *The Psychology of Early Childhood*, that recovery in children can largely be ascribed to a process of maturation. James' mother would have no hesitation in stating that psycho-therapy can claim definite cures, although the story did go round the village where he lived, " You couldn't clean up a boy like that with only talk ; he must have had some medicine on the sly ! "

Drawings, dreams, choice of ages, what he will do when grown up, spontaneous wishes, etc., are all significant in disclosing the deeper levels of the mind. Andrew, for example, aged 8, was " backward," with an I.Q. of 135 ; he wanted to be an explorer " and make history to make it harder for other children at school " ! There is a great deal that could be said here, but time is short, and I want to give the rest of my attention to the subject of Play.

Play is the most useful method of treatment in younger children. Play is the most revealing of information regarding the young child's conscious and unconscious processes, but it must not be regarded as an isolated therapeutic entity, divorced from other methods of learning to know the child. I am deliberately avoiding the word " play-therapy," because as a separate and specific treatment it does not exist. We might as well use such elaborations as " conversation therapy " and " dream therapy " in adult treatment. Play *is* made use of in therapy, however, play being the tool or instrument of treatment, but it is merely one instrument of many.

The child comes into the room and sees a collection of all kinds of toys. The therapist observes carefully but casually :

I. *His choice of material.* Choice of material is useful in diagnosis as well as throughout therapy.

II. *Type and content of his play.*

I. *Choice of material.*—Examples :

(*a*) The obsessional child rejects dirty play, is bewildered as to choice

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of materials, is often compulsively driven to include all the toys in his "story."

(*b*) The anxious, over-tidy, "good" child spends the whole interview preparing and clearing up, and often asks at the end, "Am I your favourite patient?"

(*c*) The over-sophisticated brought up on "reason" are scornful, especially of dolls, and to begin with avoid play of any kind.

(*d*) One boy was seriously waylaid, and could not start until he had eaten up any odd crumbs and small pieces of paper on the table. "They are like babies and must be protected."

II. *Type and content.*—The child may play on realistic or on symbolic planes, and he usually, especially the very young and the more imaginative, intersperses the whole with fantasy and dramatic play. Whatever the type of play, it is necessary in bi-weekly and still more in weekly interviews to guide the treatment by two criteria:

(*a*) the central emotional problem; whether this be anxiety, guilt or other hurt suffered by the child,

(*b*) the symptoms, their meaning and their defences,

and although children bring more self-interpreting material than adults, yet many fantasies and much of their play requires interpretation. In the less frequent sessions of both clinic and present-day private practice this obviously needs careful handling.

The type and content can best be demonstrated by means of a case:

Patricia, aged 5½, *I.Q.* 132.

Symptoms on referral.—Unmanageable at school; scratches and hits teachers and children, tears up books and smashes apparatus; excluded temporarily.

Fits of temper at home the last two to three months; prior to that described as a "little saint."

Masturbation. Severe constipation.

Phobias centering around bath plug and lavatory chain, with fear of the water gurgling out.

An only child. Mother over-anxious with some obsessional tendencies. Much discussion and dissension between parents regarding Patricia's upbringing.

Patricia is a lovely, clear-skinned child, well poised, graceful, with excellent language ability; imaginative. She works in interviews with tremendous energy, her drawings are vivid and expressive (she produced a whole book of these), but is excessively tidy, neat, clean, exacting and precise in attitude and demeanour. Dislikes getting her hands dirty. Is over-active and tense. Throughout treatment, but gradually lessening, attacks of shuddering with pallor and tension, always in relation to anxiety, frustration, aggression.

During treatment she played with materials including every type of toy; play was widely varied, and different types of play were intermingled at each interview.

These types of play were: A. She began, as might have been expected in a child with severe constipation and some obsessional tendencies, with lavatory play expressing the anxiety and curiosity which centres around her excretory functions:

(*a*) Of a reality type with dolls as babies in the process of habit training; treating constipated baby by laxatives, etc., slapping if cannot defaecate; babies refusing. This brings out her own fears regarding early illnesses when she had blood in the faeces and green faeces. A plasticine mother is brought into play; the baby soils herself and mother had to clear it up.

(*b*) Of a fantasy type. A "china party" to which bathroom furniture and utensils all came, each talking his own language; she gave all of them names. "Bush Ush," the wash basin, was the rebel of the party. He always ate too much at a feast, was disobedient, and washed the floor with milk instead of water. He appeared in play again and again.

B. Teacher and child game with psychiatrist. Patricia the teacher was harsh and depriving; folded up even the carpets on the floor so that psychiatrist could not see the colours; threatened to tie my hands if I couldn't keep still. (Expressing possibly her own anxiety at school regarding fantasying or looking away from her task.)

Her negative transference is expressed here in a play situation, but later shifts to the person of the psychiatrist with much ambivalence. In this she showed

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open aggression by blowing in my face, but called it " the dolls' house wind and thunder " (for which therefore she was not responsible). Later there were attempts at overt pinching and scratching, which psychiatrist preferred to divert towards inanimate objects ! As treatment progressed the wind " blew " at psychiatrist, but Patricia kindly " turned it off."

She constantly scolded psychiatrist for expression of any " happy or contented noises," and as she did so showed severe anxiety tension with shuddering. She calls her shuddering " my excitement," and says it is of two kinds, nice and nasty. " The nasty one I call the ' Beastly Beast ' ; don't ever tell him not to do things or he just gets wild." When psychiatrist interpreted the " Beastly Beast " as her own anxiety-aggression, she responded, " There are two ; one is black and white with rows and rows of teeth and no arms, and the other ' blue and gold ' with only two rows of teeth, but he hates soft skin." She adds, " There was a nice smiley person there and he killed her."

The interpretation of her play with materials released in a symbolic form her aggression repressed by her own superego and her mother's upbringing. This resulted in the release and diminution of her anxiety (the shuddering) and the verbalization of her ambivalence. When she had accepted her negative transference partially she went through—

C. A phase of regression expressed in baby play typical of a child of six months to three years old ; lying on her back kicking, saying, " I'm at the kicky age," making crooning noises and talking baby talk (this in a child with a mature and well enunciated vocabulary), learning to walk, my helping her. At a later stage being pushed round in a baby chair. All this play was accompanied by much more positive feeling ; it was relaxed and free from tension.

D. Eye testing play : this took us back to the bathroom set.

(*a*) With a group of " children " (dolls) having their eyes tested by a doctor.

(*b*) With bathroom utensils and fittings all wearing glasses made of plasticine. " Bush Ush " refused to wear his glasses and fell ill with pneumonia and tic dolorasma ! She said, " He is a naughty boy ; his eyes are very dim."

She then recalls that when she was three she had measles, her eyes were " dim," and she was very frightened of becoming blind. She drew all these scenes but psychiatrist was never allowed to look at them without permission, so she always did me a rough drawing first, " to keep you contented ; something to look at so your eyes won't get *bad*." She showed much anxiety if ever psychiatrist took her glasses off, saying, " Glasses are like gloves, the eyes' clothes." One assumed this related to the taboo on looking at forbidden parts of the body in the bathroom. For example, she said, " What do you call the part you sit on ? My Mummie calls it nothing." She then added that her mother said her eyes were for Mummie and Daddy alone.

E. The last phase of play was with sand and water of a type suitable to her age, in which she was much gayer, less exacting and free of tension.

Towards the end of treatment during the resolution of transference she showed keen interest in having her permanent teeth counted ; she stood very still, quiet and smiling during the process, asking how many of her grown-up teeth were coming through, as though accepting her early biting aggressive wishes.

At the end of treatment (once weekly for 8 months) Patricia became more carefree, could splash paints, play with sand and water. At home she lost her fear of the lavatory chain and could put her toe on the bath plug. Her habit of tension and shuddering disappeared. She returned to school ; could now play with children of her own age, and became less dependent on her mother.

This case illustrates the variety of play in the young child, his capacity for setting his own pace, and for making selections of materials and methods to suit his own needs on his own initiative.

During the whole of treatment one must constantly link up the two aspects, subjective and objective, described above. One should compare and contrast the content of play with the fluctuations of the child's symptoms and also with his realistic life, for example his relationship with his parents and siblings, as well as with his general behaviour at home and at school. It is here one finds indispensable the week by week consecutive work with the psychiatric social worker who checks

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up on the home situation. Unless one does make this comparison and evaluation there is the danger of losing oneself in the fascination of the material, its symbolism, and the emerging psycho-pathology, and forgetting the child who is the author of the play, and the victim of the symptomatology. Personally I do not believe in any set symbolism or rigid formal pattern of play, and I think that treatment progresses more rapidly and successfully with the minimum of play material, provided it is the right kind. Adherence to any specific rigid technique increases the child's tendency towards patterned modes of thinking, rather than releases him from his mental and emotional bondage.

As to interpretation of play, whether interpretation of the symbolism of material, or interpretation of interruptions, defences or resistances, this calls for the greatest skill and judgment in selecting the one vital situation out of the many possible, particularly when one is restricted to once-weekly interviews; while the handling and interpretation of transference requires subtle and sensitive understanding, and must not be forced into rule-of-thumb preconceptions. Again I would like to emphasize that play is the most intricate field of the child therapist's art; it is comparable to analytic work in the adult, and should never be attempted by the untrained doctor, however good his rapport with children, and however clever he is with the Hornby train at home.

The technique of child treatment then lies in a threefold study of the child:

(1) his temperamental make-up and basic pattern of personality,

(2) the psycho-neurotic superstructure, the psychopathological personality,

(3) the symptoms.

and through play, talk and other forms of exploration of his conscious and unconscious mind, determining which of the mechanisms, repression, regression, identification with parents, projection, etc., are represented by the symptom and his central emotional problem.

There is no magic in play treatment nor in the play materials themselves; the magic, if any, lies in the skill and experience of the therapist combined with certain essential personality qualities, his receptivity, his wisdom and his suppleness in interpretation. His attitude to the child is an active-passive one; he must be patient and willing to listen, be sympathetic yet not sentimental. He must be observant, take an intimate part, be able to play, live in and share for the moment the child's feeling life, using his instincts and intuition all the time, yet with his rational faculties keenly at work in judging and evaluating the substance not only of each interview but in piecing together the mosaic of several interviews. Many single interviews have little meaning alone, but a consecutive series reveals a clear-cut theme. I think *Technique* almost too bold a word for the title of this paper; child treatment is still in its infancy, and a technique has yet to be evolved.

In future work, what is needed is not a further elaboration of intricate toy material and play apparatus, so much as a deepening of the insight and imaginative vision of the therapist, and the enlargement of his knowledge through careful studies with individual children, and follow-up records of these children into adult life. Particularly I would like to stress the all-round training of the child-psychiatrist in all the known methods of access to the child mind.

Lastly I would advocate a better liaison between the Child Guidance Clinics and other branches of medicine, particularly paediatrics, mental deficiency, psychosomatic medicine, and last, but not least, adult psychiatry.

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RELATION OF HISTAMINE HEADACHE TO POST-CONTUSIONAL AND PSYCHOGENIC HEADACHE.

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[Received December 18, 1944.]

Von Storch has induced headache by the sudden intravenous injection of minute amounts of histamine phosphate in three groups of persons—the first group consisting of those subject to migraine, the second group composed of those suffering from chronic recurrent non-migraine headache, and the third group consisting of those not subject to headache. He has found that in persons subject to migraine the headache produced by histamine is frequently similar in character to their habitual headache (though bilateral), while in those subject to chronic recurrent non-migraine headache the experimental headache is only occasionally similar to their usual headache. From the evidence presented by him, linking migraine and histamine, the latter would appear to be a useful drug for distinguishing migraine from other forms of recurrent headache. Using a technique similar to his, experiments were performed at this centre to determine the relation of histamine headache to post-contusional and psychogenic headaches, and the results are worth recording.

Clinical Material.

From among the in-patients of a neurosis centre 75 able-bodied men who were free from physical disease were selected for the test. Their average age was 25·6, range 18 to 36. Ten men who had not complained of headache were chosen for determining dosage and effects in the initial stages. Of the 65 men who were subject to chronic recurrent headache, 43 dated their symptoms from a head injury. In 10 the head injury had been severe, involving fracture of the cranial bones and necessitating in-patient treatment for several weeks; in 33 it had been mild, not causing any fracture or greater disturbance than a few minutes' unconsciousness; while 10 gave a history of accident with doubtful head injury and no loss of consciousness. In 21 of the men the head injury had been sustained within the last two years, and in 22 it had occurred more than two years before, often between ten and twenty years before. The shortest interval was three weeks. There was no history of head injury in 12 men.

Procedure.

The data about the patient's headache were collected on an earlier occasion, so that he had no reason to connect his symptoms with the histamine injection. Before the injection was given some men showed their anxiety by flushing, rapid pulse, sweating, trembling and raised blood pressure, and it was obvious that they had considerable dread of any injection. Each patient was told that this was a " test of circulation which would indicate his condition " and probably " clear his head," and he was instructed to describe his feelings during and after the injection.

The solution was prepared by diluting 1 c.c. of a standard 1 : 1,000 solution of histamine phosphate with 9 c.c. of sterile physiologic sodium chloride. The method consisted in giving (when the patient was comfortably reclining on a couch) as quickly as possible an intravenous injection of this solution in the same dosage as given by von Storch, i.e. 0·00075 to 0·0008 mgm. per kilo of body weight.

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Results.

The following table shows the results:

Table I.

Patients.			Histamine headache. Like his usual ache.	Unlike.
10	Head injury	Mild 33	4	5
		Severe 10	1	3
65 with chronic recurrent headache	Accident, but doubtful head injury	10	—	3
	No head injury	12	3	4
Total 75	Total histamine headache		8	15

Transient headache was reported by 23 men, of whom 8 said it was similar to their habitual ache and 15 said it was dissimilar. Of 43 patients with clear history of head injury 5 said it was like their usual headache and 8 said it was unlike. Among men with no history of head injury 7 reported headache, of whom 3 said it was similar to their usual ache, but the rest did not think so.

Clinical Observations.

It was brief, not lasting more than five seconds in all except two men. One of the latter came into the room complaining of a throbbing ache on top and back of head; 35 seconds after the injection he complained of flushing, throbbing and intensified form of his usual headache and like it when he has been running. This passed off in 70 seconds, leaving him much as before the injection. The second man complained of severe headache for over 3½ minutes. One patient, who was very frightened and was panting and wriggling before the injection, complained of no fresh symptoms at all and said that the injection had relieved his headache. Another man complained of a feeling of tightness over top of scalp "like after wearing tin helmet" which lasted about 2 minutes, but he refused to call it a headache. In one patient there was no aggravation either of throbbing or of headache until he stood up, when they appeared in an intensified form, but disappeared after about 12 seconds.

Others described their sensations as tightness and fullness of the head, numbness across forehead, blood rushing to the head or funny feeling on top of head. The majority of the men also reported throbbing, flushing and dryness of the mouth; 6 complained of throbbing, chiefly in the forehead, and 8 chiefly in the temples. One patient described throbbing sensation in his ears, which lasted about 5 seconds.

Peculiar taste in the mouth was spontaneously reported by 5 men. Two complained of dizziness. One of these had apparently received a small amount of the fluid subcutaneously. Sweating of the palms in one and profuse sweating of the feet only in another was also observed.

Other Reactions.

One patient, who was pale when he came in, said he usually gets panicky feelings in surgeries; 20 seconds after the injection he started to cough and sniff, complained of a peculiar taste in his mouth, and also felt it rushing up from the stomach, and "beating"—no throbbing in head at all, but only in epigastrium for a moment or two. Another man, 15 seconds after the injection, put his hand to his forehead, which was perspiring, and described momentary feeling of heat and numbness, not throbbing, which he compared to the sensation of falling asleep. He also complained that my voice became distant and said, "I think I am going to be deaf." A patient with a long-standing hysterical facial tic said the injection had done him good and with it the tic disappeared. These effects appear to be due to anxiety or suggestion and not to the histamine itself.

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Continuous Injection.

Continuous injection of a larger dose (0·001 mgm. per kilo of body-weight), taking 3 minutes over it, was given to three of these patients, but no effect was reported until after the injection had been discontinued. About 8 hours after the injection two patients complained of headache of moderate severity, which lasted for about an hour in one and for an hour and a half in the other. The third patient reported headache 26 hours after the injection, and attributed it to the injection because it was unlike his usual headache.

It is doubtful whether the headache in these patients was really due to histamine.

Discussion.

Due allowance should be made for certain fallacies and errors before the results are interpreted. For instance, the doses may not have been large enough. Anxiety on the part of the patient just before the test would no doubt vitiate the result. Though many of the men showed their anxiety as soon as they came in, examination of the individual records does not demonstrate that this influenced the result of the injection so far as the headache was concerned.

The percentage of those who complained of headache after the injection is much the same as that obtained by von Storch, where about a third of those subject to chronic recurrent non-migrainous headache complained of headache after the injection.

There was, however, no correlation between the presence or absence of history of head injury and the intensity or the character of the induced headache. Nor was there any relation between the latter and the neurotic symptoms complained of by the patients.

It would appear that there is a big difference between individuals in their response to intravenous histamine, and the same individual may vary in his response at different times to the same dose. Without further experiments it would be difficult to say why this should be so, but patients who suffer from chronic recurrent headaches cannot be easily persuaded to have repeated doses of a drug which produces or aggravates headache.

Intelligence and suggestibility would also appear to affect the result. Once they got to know what was being looked for or what was the more advantageous result, it would appear in many of them. For instance, the suggestion made before the injection to the effect that it would probably "clear their heads" led the majority of the men to say that it had done so as soon as the immediate effects of the histamine had worn off; the man with the facial tic has also been free from it ever since.

Sedative drugs, especially aspirin, may prevent the development of histamine headache. Some of the patients have had such drugs, but as the interval since the last dose was at least 15 hours, it is unlikely that this factor affected the result.

If one assumes that the headache following head injury is predominantly physiogenic, then histamine given intravenously is of little use for distinguishing such headache from psychogenic headache.

In patients with history of head injury, even when on clinical grounds the headache appeared to be mainly physiogenic, it could not safely be regarded as such in this investigation.

Summary.

1. 65 patients with chronic recurrent non-migraine headaches were given sudden intravenous injections of minute doses of histamine phosphate. Of 23 who reported headache, 8 said it was like their usual ache, the rest did not think so.

2. Of 43 men with history of head injury, 13 complained of headache; 5 said it was similar to their habitual headache, and 8 said it was dissimilar.

3. Of 10 men with doubtful history of head injury, 3 reported headache which was unlike their usual ache.

4. Among 12 patients with no history of head injury, 3 complained of ache similar to their usual headache, and 4 said it was unlike their usual headache.

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5. Histamine given intravenously is of little use for distinguishing post-contusional headache from psychogenic headache.

My thanks are due to Dr. W. S. Maclay and his staff for their co-operation and permission to publish this paper.

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Part II.—Reviews.

Human Neuroanatomy. By OLIVER S. STRONG and ADOLPH ELWYN. Baltimore: Williams & Wilkins Co., 1943. Pp. x + 417. Price 33s.

This is a very good book with three hundred and twenty illustrations, many of which are new. The book is divided into two main parts, the first ninety odd pages dealing with embryology, histological structure, etc., whilst the last three hundred and twenty deal with what the authors call applied neuroanatomy.

A great many of the new illustrations are very well done and add greatly to the value of the book.

There are a number of good books on neuroanatomy, but this is quite one of the best.

G. W. T. H. FLEMING.

Behavior and Neurosis. By JULES H. MASSERMAN, M.D. Chicago: University of Chicago Press, 1943. Pp. iv + 269. Price

This very interesting book is based on a series of experimental studies of animal behaviour carried out in the neurophysiological laboratories of the Division of Psychiatry and the Otho S.A. Sprague Institute of the University of Chicago. The book is divided into three parts, the first dealing with the historical aspect of the work, the second with dynamic psychology and experimental neuroses, and the third with the clinical application of the experimental results. The experimental work was carried out on cats.

The author considers that four fundamental principles of behaviour underlie the complex phenomena of clinical psychiatry. These are:

1. Behaviour is motivated by the biological needs of the organism.
2. Behaviour is contingent on and adaptive to the meanings of the "objective" and social environment as interpreted by the individual organism.
3. Behaviour relieves bodily tension not only by direct, but also by substitutive or symbolic, activity.
4. When psychobiological motivations or environmental meanings become excessively confused or conflictful, behaviour correspondingly becomes abnormally indecisive, substitutive, diffusely symbolic and biologically inefficient, i.e. "neurotic" or "psychotic" in expression. Just as on the experimental animals, the author found that a combination of five therapeutic procedures—
   (1) Diminution of conflictful bodily needs,
   (2) Reassurance, suggestion and persuasion,
   (3) "Forced solution,"
   (4) Social examples and identification,
   (5) "Working through,"

secured the most rapid and permanent therapeutic results.

There is a great deal of therapeutic value in this book based on conditioned reflex physiology, and it will repay careful study.

G. W. T. H. FLEMING.

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The Role of X-Ray in the Study of Local Atrophic Lesions of the Brain.

Unilateral atrophic cerebral lesions occurring early in life frequently produce cranial asymmetry that may easily be detected in plain skull radiographs. This asymmetry consists in ipsilateral decrease in size of the cranial chamber and often increased size of the paranasal sinuses and mastoid air cells. Such examinations should never be omitted in the study of the epileptic patient.

In many cases of post-traumatic epilepsy ordinary skull radiographs reveal no localizing information, but tears and deficiencies of the dura tend to produce characteristic changes, and occasionally point out the exact site of a previous skull injury.

Carefully performed encephalography should be undertaken in almost all cases in which focal cerebral atrophy is suspected. The general region where the epileptogenic lesion will be found is frequently shown by this method. Occasionally a focal atrophic lesion may be present, although encephalography is negative. This is rare, and usually a normal encephalogram is a strong contraindication to craniotomy unless the other evidence available is very convincing.

The exact site of a focal epileptic lesion can usually not be determined by radiographic examinations alone, although the general region can be ascertained in most instances. Careful correlation of the clinical, electrographic and radiographic findings is essential.

Cerebral arteriography is occasionally a helpful procedure in the diagnosis of focal epilepsy, particularly when aneurism or hemiangioma is suspected. (Authors' abstr.)

Clinical and Electroencephalographic Studies.

1. One hundred cases with organic brain disease and delta activity in the electroencephalogram were studied for correlations of the psychiatric status with the electroencephalogram and anatomical localization.

2. This investigation showed that disturbances such as memory defect, mental retardation, dullness, inability to concentrate, overactivity and slight euphoria can occur without any delta activity in the electroencephalogram. They may be present also with a small amount of delta activity. Higher amounts of delta activity are associated with the syndromes of clouded consciousness and facetiousness. The delta activity was more equally distributed over the brain in cases with sleepiness and clouding of consciousness than in cases with facetiousness. The latter showed a relatively high amount of delta activity over both frontal lobes and a smaller amount over other regions.

3. Facetiousness is associated with dysfunction, not afunction, of both frontal lobes with a smaller degree of dysfunction of other parts of the hemispheres. The electroencephalographic results in this respect are in good agreement with the fact that facetiousness was most frequently found in lesions restricted to the frontal lobes and not invading other parts of the hemispheres.

4. The degree of correlation between the electroencephalogram and the psychiatric symptoms was higher than the degree of correlation between the anatomy of the lesion and the psychiatric symptoms. Electroencephalography promises to be of further assistance in the correlation between disturbances of cerebral mechanisms and behavior, particularly in the differentiation between such psychic disturbances as are associated with a pure loss of cerebral tissue and such psychic disturbances as are associated with dysfunction of the remainining cerebral tissue.

(Author's abstr.)

Electroencephalography in Behaviour Problem Children.

The EEGs of the 20 best behaved boys in a junior high school class of 131 boys were compared with the tracings of the 20 most troublesome boys in the class. These represented extremes from the point of view of behaviour and adjustment in a given situation. The age range of the

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two groups was the same (13–16½ years). Choice of boys over 13 years of age made comparison easier because adult patterns are then already established, and consideration of normal year to year variations of tracings in children below this age was thus made unnecessary. Social, economic and cultural background was similar in the two groups, thus eliminating an important variable found in the groups compared in all previous studies by other authors. The boys in the most troublesome group were behaviour problems at home and in the neighbourhood, as well as in the school situation. The boys in the so-called normal group presented no difficulties of behaviour in school, home or neighbourhood. There were 12 abnormal tracings in the first group and 11 in the second. Intelligence level did not in itself have any influence on the nature of the tracings.

The EEGs of the 10 best behaved and least delinquent boys in an institution for delinquent boys and the 10 most chronic delinquents with the most severe and chronic types of behaviour disorder were similarly compared. Four of the former and 9 of the latter 10 boys showed abnormal tracings.

Results of comparison between intelligence, efficiency of performance and personality with type of EEG were also similarly contradictory, confusing and difficult to interpret. Individual case studies illustrated these contradictions and discrepancies over and over again.

The most consistent incidence of abnormal EEGs was found in the most poorly behaved institution group, in the group with the severest and most chronic disorders of behaviour. This would suggest that the finding of an abnormal cortical electrical pattern may be indicative of a physiological disturbance which influences behaviour adversely. However, the very frequent presence of abnormal rhythms and patterns of the same kind found by us and by other observers in children without behaviour disorders, and of normal and abnormal tracings in apparently similar types of behaviour problem children, make it difficult to interpret the significance of the findings in the individual case. The EEG is, of course, valuable in the detection of hidden focal lesions and of cryptic epilepsy. The most that can be said at present for the value of other findings of dysrhythmia in behaviour problem children is that they may be regarded as a probable additional unfavourable personal factor, among many other factors, adversely influencing behaviour. Studies and results to date do not warrant further interpretation or clinical application in diagnosis, therapy or prognosis. (Authors' abstr.)

Age and Electroencephalographic Abnormality in Neuropsychiatric Patients.

The EEGs of 1,593 neuropsychiatric cases are analyzed and the tracings are classified as "normal" or "abnormal." "Abnormality" is defined as activity with a predominant frequency outside the range of 8 to 12 per second or a tendency to change greatly with overbreathing. This criterion is applied to all records regardless of age or clinical condition. "Abnormal" records are further classified as slow, fast, and mixed slow and fast.

The percentage of "abnormal" records found in the various neuropsychiatric conditions varies from 22 per cent. in alcoholic psychosis to 54 per cent. in senile and arteriosclerotic disorders. The order is as follows: Alcoholic psychosis, 22 per cent.; schizophrenia, 23 per cent.; psychopathic personality and behavior disorders, 31 per cent.; manic-depressive depressed, 31 per cent.; psychoneurosis, 34 per cent.; manic-depressive manic, 42 per cent.; psychosis with mental deficiency, 50 per cent.; involutional psychosis, 51 per cent.; senile and arteriosclerotic psychosis, 54 per cent. A control group primarily between 20 to 30 years of age has 10 per cent. abnormal EEGs.

Involutional psychosis and manic-depressive depressed conditions are conspicuous because of a large amount of fast activity, whereas senile and arteriosclerotic psychosis, psychosis with mental deficiency, and psychopathic personality and behavior disorder are associated with a large amount of slow activity.

The very wide range over which the various neuropsychiatric conditions are distributed makes it necessary to study the incidence of electroencephalographic abnormality as a function of age. When this is done, the relationship between percentage abnormality and age is found to be a hyperbolic curve with greatest abnormality in youth and old age, and least abnormality between 25 and 45 years. The changes of incidence of electroencephalographic abnormality with age are so great that the factor of age cannot be neglected in the evaluation of the EEG. Furthermore, marked variations of more specific types of electroencephalographic abnormality with age are also found. For example, the incidence of slow activity falls rapidly with increasing age, from 20 per cent. under 15 years to 5 per cent. at age 45 to 55; and beyond this the incidence of slow activity rises. On the other hand, a rapidly rising incidence of abnormal fast activity occurs with increasing age, from 4 per cent. under 15 years to 20 per cent. at age 45 to 55, with a probable decline beyond 55 years.

The electroencephalographic findings in the various neuropsychiatric conditions are largely explained by changes associated with age. This makes it necessary to readjust our previous ideas of normality and abnormality in the classification of EEGs so as to take into full consideration the major changes and trends associated with age. In this regard, the present review of a large and diversified group of cases covering a wide age range will provide preliminary standards of comparison, and may be useful as a guide to further study along the same lines.

(Author's abstr.)

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Effects of Stimulation and Lesion of the Median Longitudinal Fasciculus in the Monkey.

Experimental stimulation of the mesial fibers of the median longitudinal fasciculus in the monkey causes ocular adduction. Destruction of these same fibers results in paralysis of adduction and nystagmus in the abducted eye on attempted lateral gaze. This is similar to the ocular syndrome described clinicopathologically in man. Vestibular function is unaffected.

On the basis of these observations, it appears that the ascending fibers in the median longitudinal fasciculus probably represent the terminal portion of the corticobulbar pathway for horizontal conjugate movements of the eyes. This hypothesis has been supported by observations made on a series of stimulations through the reticular substance, the vestibular nuclei and their emerging fibers. (Authors' abstr.)

Effect of Insulin Hypoglycemia on Glycogen Content of Parts of the Central Nervous System of the Dog.

In the determinations of the glycogen contents of the various parts of the central nervous system of nine dogs, subjected to intense hypoglycemia of various durations, it was observed that the decreases in glycogen concentration did not take place in a haphazard fashion, but occurred in a definite order, which, with the exception of the cerebral cortex, had a rostral to a caudal progression. The concentrations in the caudate nucleus and the corpora quadrigemina decreased first, followed by those in the cortex, the thalamus, the cerebellum and the medulla. The values for the cord were never significantly below the normal. These concentrations were correlated with the allocations of the symptoms of hypoglycemia. (Authors' abstr.)

Photic Driving.

Modification of the spontaneous electrical activity of the cerebral cortex of cat, dog, monkey and man may be produced by intermittent photic stimulation of the retina, so that the electroencephalogram obtained from the occipital cortex may take on a frequency synchronous with that of the flicker. The effect is augmented by increasing the intensity of the luminous flux, with a maximum at approximately 80 foot-candles. The driving is more pronounced when the photic stimulus is at the blue end of the spectrum than when it is at the red end. The cortex of the macaque monkey may be made to follow a flicker with a frequency of 34 per second, but the optic nerve and the lateral geniculate body will follow frequencies of 62 and 59 cycles per second respectively. Lesions of the visual pathways impair photic driving. (Authors' abstr.)

Post-Traumatic and Histamine Headache.

Twenty-two patients with a history of headache following injury to the head received 0·1 mgm. histamine base (0·275 mgm. of histamine diphosphate) intravenously.

Headaches were produced by this injection, which in 13 patients were identical with the post-

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traumatic headaches in character and location and in 3 patients were strikingly similar. In 2 patients headache failed to develop.

The prompt decrease in systolic blood pressure after the injection of histamine was followed by a secondary rise which was nearly as great (22 and 18 mm. of mercury respectively). This rise was probably due to a response of the sympathetic nervous system produced reflexly by the primary changes incident to the injection of histamine.

Headache appeared as the blood pressure was rising.

The majority of the patients with histamine headache obtained some (occasionally striking) relief by sitting upright. This is inconsistent with reports in the literature that lowering of the intracranial pressure of the cerebrospinal fluid aggravates histamine headache.

It is possible that the injection of histamine activates the physiologic mechanism which is involved in the production of some types of post-traumatic headache.

The possibility that the injection of histamine may influence favorably the symptom of post-traumatic headache is suggested by results in some patients. (Authors' abstr.)

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Experimental Production of Focal Epilepsy.

1. In a series of five monkeys an "effective" substance placed directly on the motor cortex resulted in the production of chronic Jacksonian and generalized seizures for periods extending over two years after operation.

2. The presence of a unilateral focus for the discharge of abnormal potentials in the region of the applied disk was demonstrated in the electroencephalogram for many months after the operation. This focus corresponded with the clinical manifestations of seizures. From previous histopathologic studies of similar material the foci did not appear to be the result of specific tissue damage, but seemed to indicate an actual physiologic zone of hyperexcitability.

3. Electrical stimulation of the frontotemporal regions with "threshold voltages" produced unilateral responses which substantiated the clinical and electroencephalographic observations. (Authors' abstr.)

OCTOBER.

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Head Injury: A Study of Patients with Chronic Post-Traumatic Complaints.

In a comparison of 68 patients with persisting complaints after head injury and 22 subjects observed after injury who had not presented themselves because of complaints, attention was given to the type of headache, the presence of items in the previous personality background suggesting instability, the severity of injury, the reports of electroencephalographic and pneumo-encephalographic abnormalities, certain ratings of "instability" and "disability" as determined by the Rorschach method, and situational factors which seemed relevant to the presentation of complaints.

The greatest difference between the patients and the controls lay in the presence of situational factors which might have produced or aggravated psychoneurotic symptoms. This was true for every type of headache. It was also evident that patients with localized headache showed less evidence of previous neurotic background and more evidence of cerebral damage from the injury. This evidence included electroencephalographic records and Rorschach "disability" ratings, with the ratings for severity of injury and pneumo-encephalographic changes tending in the same direction, although less significantly. Except for a few patients with hemicranial headache, somewhat resembling migraine, patients with all other types of headache, especially those of bizarre and generalized distribution, showed previous personality instability similar to that of psycho-neurotic patients and evidence of "instability" in the Rorschach test resembling that found for neurotic patients. The evidence for patients complaining of symptoms other than headache also tended to resemble that for neurotic patients.

A follow-up study of 82 patients with post-traumatic symptoms previously treated in this institute indicated that the long-term results with spinal or with cranial subdural insufflation have been no better than the results following pneumo-encephalographic treatment, and that for none of these patients could the influence of other factors be ruled out. The results in a few patients treated by a direct operative procedure suggest a limited application of such measures in carefully selected cases.

Studies of the postural vascular responses did not indicate any effect in patients with head injury which differed from that in psychoneurotic patients or in patients convalescing from other illness, nor have they given any lead to treatment other than to suggest the value of exercises for hardening and relaxation.

The concept of mechanisms presented here involves a relation between physical and psychologic factors, and emphasizes the need of considering the person as a whole in the prevention and cure of post-traumatic symptoms. (Authors' abstr.)

The Electroencephalogram Associated with Epilepsy.

The electroencephalograms of 100 patients with recurrent epileptic seizures could be classified with considerable accuracy according to the classification of Jasper and Kershman, which is based on the localization of the discharge. The results of the study are in keeping with the hypothesis that most epileptic discharges (over 65 per cent.) apparently arise as local or focal disturbances in the brain. There appears to be a distinct correlation between the location of the electrical abnormality and the type of clinical seizure suffered by the patient, as described by Jasper and Kershman.

It appears that high voltage abnormal waves in the electroencephalograms of epileptic patients commonly (in over 50 per cent. of the 65 patients from whom such waves were recorded) take on a rhythmic 3 to 6 per second pattern for brief, or more prolonged, periods. This seems to hold true regardless of whether the waves originate in a focal cortical discharge or in a deeper disturbance. When these 3 to 6 per second slow potentials are of medium voltage and occur relatively infrequently, or are confined to "silent" areas of the brain, there may be no associated symptoms. If they are of high voltage and involve large areas or regions, such as the left temporal lobe, there may result a variety of manifestations, such as "psychomotor" attacks, "psychic equivalent or variant" states or of episodes of "amnesia," as described by Gibbs, Gibbs and Lennox. At times an apparently similar type of electrical abnormality is seen in the records of behavior problem children, as reported by Jasper and associates, or is associated with periods of mental dullness, as observed by Putnam and Merritt. It seems that the electrical pattern or abnormality in all epileptic patients with this slow rhythmic type of disturbance is essentially the same, but is non-specific, and that the variability in the associated symptoms depends largely on the location and intensity of the discharge.

This hypothesis seems to explain why so-called psycho-motor electrical patterns (3 to 6 per second rhythmic slow waves) may be seen in patients who have no history of "psychomotor" clinical manifestations, and yet may be associated with such attacks in other persons.

In the present study all patients with a history of episodes classified as of "psychomotor," "psychic equivalent or variant" or "amnesia" type also had focal, *petit* or *grand mal* seizures.

Evidence indicates that in a high voltage epileptic discharge high frequencies do not necessarily produce "overactivity" or slow frequencies "underactivity." This observation, as recorded here, applies only to the abnormal waves associated with epilepsy.

In the formation of the slow waves (random or rhythmic in the electroencephalograms of epileptic subjects) it is suggested that, although the periods of activity of the neurons are more or less synchronous (are simultaneous—show hypersynchrony), the resulting composite impulse

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discharges which presumably contribute to the slow potential changes are asynchronous and often of high frequency. In the case of fast waves (at least when rhythmic), on the other hand, the periods of activity of the neurons, as well as the impulse discharges, may be synchronous. (Author's abstr.)

The Electroencephalogram Associated with Chronic Alcoholism, Alcoholic Psychosis and Alcoholic Convulsions.

In a study of the clinical histories and electroencephalograms of 157 patients with chronic alcoholism with and without psychosis, including patients with convulsions due to chronic alcoholism, the following observations were made:

The incidence of electroencephalographic abnormality in patients with chronic alcoholic disorders increases with age.

Persons with chronic alcoholism without psychosis, irrespective of the duration of drinking, show essentially nothing of significance in the electroencephalogram.

Chronic alcoholism with psychosis is in general associated with an incidence of electroencephalographic abnormality which is higher than normal. In patients with alcoholic psychosis the presence of confusion or hallucinations is frequently associated with electroencephalographic abnormality, and the disappearance of hallucinations or confusion is often accompanied by a change toward a more normal electroencephalogram.

No evidence of paroxysmal dysrhythmia was found in 5 patients with pathologic intoxication, although 3 of the 5 patients had abnormal electroencephalograms.

Of the patients with chronic alcoholism with psychosis, the highest incidence of electroencephalographic abnormality was found among those with deterioration or Korsakoff's syndrome. No specific electroencephalographic pattern was found in a group of four patients with Korsakoff's psychosis.

A relatively low incidence of electroencephalographic abnormality (17 per cent.) was found in a series of 24 patients with "rum fits" (with a negative family history and a negative past history of epilepsy and with seizures occurring only in association with alcoholism). On the other hand, a relatively high incidence of electroencephalographic abnormality (75 per cent.) was found in a large series of patients with idiopathic epilepsy with onset of seizures in the same age range as that of the patients with "rum fits."

In spite of the occurrence of seizures, patients with "rum fits" do not have the inborn epileptic predisposition observed in persons with idiopathic epilepsy.

An abnormal electroencephalogram may be of aid in predicting the duration of illness in patients hospitalized for chronic alcoholism. (Authors' abstr.)

The Hypothalamus and Affective Behavior in Cats: A Study of the Effects of Experimental Lesions, with Anatomic Correlations.

Lesions destroying the immediate region of the ventromedial hypothalamic nuclei in cats result in loss of favorable response to friendly treatment and handling, and in change from a friendly behavior pattern to one of malevolence and savageness, to a marked or an extreme degree. Attempts to produce this result by means of other lesions failed. Efforts to modify this behavior pattern by lesions or ablations of higher regions of the brain have also thus far essentially failed. The details of the mechanisms controlling or permitting the change are obscure. (Author's abstr.)

ARCH. PSYCHOL. N.Y.

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An Analysis of Age-progress Curves as Related to the Mental Growth Curve. *Hamlin, R. M.* . . . . . No. 293

Changes in Primary Mental Abilities with Age.

1. A total of 126 11-year-old, 117 13-year-old and 103 15-year-old boys were given the Chicago Tests of Primary Mental Abilities. These tests measured six mental abilities or components: number, verbal understanding, space, word fluency, reasoning, and memory. The three age-groups were approximately equivalent in the distribution of their general intelligence scores as determined by group tests.

2. There were statistically significant increases with age in the mean scores of the six components.

3. There was a consistent tendency for variability of scores in each component to increase with age.

4. An analysis of the data in terms of the percentage of overlap of scores obtained in the three age groups revealed the following: (*a*) The greatest amount of change through these age levels was in word fluency; (*b*) reasoning and verbal meaning were next in order of amount of change; (*c*) memory, space and number exhibited the least amounts of change.

5. An analysis of the intercorrelations among the six primary mental abilities led to several findings. The memory factor was very little related to the other factors at any age from 11

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to 15, and showed no consistent change in this respect within this age range. With this exception there was a consistent decrease in the intercorrelations among the six abilities as age increased. The correlations of each one of the mental components with the other five combined showed the same decrease in correlation with age. When all of the intercorrelations were averaged, the decrease with age was quite clear-cut.

6. An analysis of the data in terms of expressing the differences between means of components at these ages in standard deviation units of the 11-year group revealed the following: (*a*) That the six mental components exhibited small differences in changes from 11 through 15 years; (*b*) that word fluency, reasoning and verbal meaning showed the most progress, space, number and memory the least; (*c*) that the growth curves for word fluency and reasoning tended to level off slightly after 13 years; (*d*) that in general, the growth curves for the six components were more alike than different.

7. The performance of the extremes of intelligence in each age group was subjected to analysis in order to determine the extent to which general intelligence level influenced the changes with age in the six components. It was found that with the exception of the memory component, changes with age in the primary mental abilities were not noticeably influenced by the general intelligence level of the subjects as indicated by intelligence tests. (Author's abstr.)

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Mental Changes after Bilateral Prefrontal Lobotomy.

The authors found from a study of 20 patients who had had lobotomies performed that there was no consistent picture of general mental impairment. In five of the patients there was a decline of from 11–22 points on the Binet I.Q., in one a gain of 18 points and in six others a slight gain. Most of these changes are outside the ordinary variation of test scores and do not agree with Kisker's findings. However, the authors agree with Kisker that "from a therapeutic point-of-view, intellectual changes are relatively unimportant." Doing rather inefficient work in the community is vastly preferable to doing better work inside a prison, or no work at all in a mental hospital.

In the reversed digit memory span test the tendency for those who scored initially at a high level is to come down, while those who scored low initially tend to improve. In the word association and vocabulary tests those whose psychotic condition interfered with performance before the operation tended to improve, while those with initial high performance tended to show some impairment. Lack of initiative and inferior planning ability are most closely related to poor performance on the maze test, though impulsiveness, or its converse, irresolution, as well as suggestibility and nervousness are also responsible for errors. A noteworthy symptom is inability successfully to divide or alternate attention between two activities.

The more careful the patient is on the maze test the more likely he is to fall into error. A pause in the motor activity of drawing whilst attention roves in search of a tentative solution is an indication of careful planning. The swift alternation of attention while keeping an end in view requires a brain well organized with rich interconnecting subcortical neural pathways. Out of 17 cases, only two showed any gain in maze I.Q. after psychosurgery. The average loss of test age amounted to approximately two years. The authors found a similarity between the maze performance of feebleminded and lobotomized patients. They regard the effect of the operation as disruption of inter-regional co-ordination.

There is a strong tendency for the lobotomized patients to make stereotyped reactions, when failure has already resulted. The repetition of errors after lobotomy can be ascribed to lack of initiative, an unwillingness or tardiness to try new approaches to a problem.

Eleven of the 20 patients had improved to a greater or less degree. Three criminally insane were improved, and one was discharged as being no longer a menace to the community.

G. W. T. H. Fleming.

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A Study of Anxiety in Young Children by Means of a Projective Technique.

One may fairly conclude from this investigation that the projective technique described in this report succeeds (*a*) in revealing many different anxiety areas in the experience of little children, the more important areas in a normal group proving to be parent-child relationships, social relationships, and daily routines; (*b*) in demonstrating a close relationship between pattern of anxiety and type of behavioral adjustment in both normal and clinical groups; (*c*) and in showing that the normative approach to a projective study of anxiety in little children is of the greatest value in the interpretation of individual differences.

It is the experimenter's opinion that this technique, with modifications as suggested in the preliminary evaluation, would be a useful one for teachers in nursery schools, in kindergartens, and lower primary grades. It seems to be useful both for therapy and diagnosis. Through this projective technique the child is allowed to express his thoughts and feelings freely. It often happens that children are burdened by ideas and desires which they cannot, for lack of words, or will not, for fear of punishment or ridicule express. This specific procedure may present an appropriate avenue of expression to the child and thus provide a means of catharsis. It will also help the teacher to locate quickly and easily those areas in which the child's fears and

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anxieties lie, if present. It seems reasonable to suppose, on the basis of data already found through using this technique, that where there are severe behavioral difficulties which are not due to disease, there is also a great deal of anxiety which is closely connected with these same difficulties.

The report illustrates clearly the surprisingly large number of unhappy, anxious responses to specific picture situations, characteristic of the so-called normal typical child.

In using a procedure of this sort, care must be taken not to attach too much importance to the anxiety score as such. It is in a careful, detailed analysis of each individual record that its value lies. Neither the total score nor the individual responses are of value in and of themselves. Each record must be studied as a whole. Here, as is so often the case, the whole is a great deal more than the mere *sum* of the parts. It is through a synthesis of the content of the report as a whole rather than through interpretation of two or three scattered responses that something of the inner world of the individual may be obtained, and an approximate pattern of anxiety may be located. (Authors' abstr).

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Vocabulary and Mental Deterioration in Senile Dementia.

The general purpose of this investigation was to study the relationship of various kinds of vocabulary functioning to mental deterioration of the type senile dementia, and to determine whether or not a given set of tests, namely, those devised by Capps, offers a valid and reliable index of deterioration. The subjects used in this study consisted of fifty patients, male and female, of the type senile dementia simplex, all residents of the Fairfield State Hospital in Newtown, Connecticut. All possible controls of mental capacity, education, age and background were maintained. The investigator grouped the patients as least, mild, and most deteriorated. This method is far from satisfactory, but was the only possible means of differentiation among the group. A group of five different types of vocabulary tests were used. These tests seemed to measure not only a knowledge of word meaning and usage, but also possibly related aspects of mental functioning.

The results show that there is a reliable, consistent, and progressive reduction in the mean scores of the synonym and antonym tests associated with the groups of subjects which had the greater amount of mental deterioration.

Since the factors of education, background, mental capacity and age were controlled as well as possible, it is felt that these could not have had any significant influence on the test scores and that, therefore, the impairment was principally, if not entirely, due to mental deterioration.

Vocabulary functioning has long been recognized as a close associate of the development of intelligence and general mental functioning; these studies tend to indicate that vocabulary functioning is also closely related to the deterioration of mental functioning.

Not only do each of the separate vocabulary tests show a progressive impairment in the ability to deal with word meanings, but they also reflect an impairment in related aspects of mental functioning.

Previous findings have indicated that the vocabulary test score tends to remain relatively constant and unchanged in deterioration as opposed to non-vocabulary test scores. On the basis of this premise, the " Efficiency Index " has been set up by Babcock (1), which is said to measure accurately the degree of mental deterioration. This study shows, however, that vocabulary functioning does not remain constant; on the contrary, these tests involving vocabulary functioning have served as means of discriminating among deteriorated patients and have given measures of deterioration.

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The synonym and antonym tests are offered as a reliable and valid measure of mental deterioration in senile dementia. These tests should be of aid in classifying patients.
(Author's abstr.)

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Measurement of Chronic Psychotic Over-activity by the Norwich Rating Scale.

A rating scale has been designed for the recording by the nursing personnel of the behaviour of patients on disturbed wards.

A reliable index of general over-activity may be obtained by combining the scores from the single-trait scales of activity, aggressiveness, destructiveness, and talkativeness into single composite scores.

Although the scale is constructed as a battery, any of the traits may be rated separately in cases where the trait in question is the only one of interest.

The results obtained indicate that the Norwich Rating Scale is more reliable than the usual rating scales for personality traits.

The results indicate that the scale can be used profitably for the study of individual patients or groups of patients.

Further clinical application of this scale is now being carried out on similar groups of disturbed patients in whom prolonged diminution of over-activity is being therapeutically attempted.

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The Incidence of Sibling and Parental Deaths in the Anamnesis of Female Schizophrenia.

The results of the present study on female schizophrenics confirm those on males only in part. While a trend is, as before, demonstrated for schizophrenics to have more sibling deaths in their anamnesis than do manic-depressives, a comparison with general paretics is not possible here and, when made with normals, turns out negative. As previously noted, there is a possibility that the former data on males were unrepresentative; that the records on the female psychotics are incomplete; or that there is actually a sex difference which reflects itself in the somewhat higher incidence of schizophrenia in males. Parental deaths occur significantly more often in schizophrenics than in normals, but are interestingly found to trend more toward the paternal side for male schizophrenics and toward the maternal one for the females. But the

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results must in general be held inconclusive until more extensive research on much larger groups has been achieved. The efficacy of such studies would obviously be increased if instead of relying upon existing case histories, which may or may not contain the needed information, as was true in the present inquiry, the data were gathered with specific objectives *ab initio* well defined. The findings do, however, amply demonstrate the feasibility of statistical studies of psychodynamic factors in mental disorder when the analysis is concentrated upon life happenings which are both universal and momentous. (Authors' abstr.)

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Sex and Age Determinants of Theatre and Movie Interests. *Lassner, R.* 241

Test Constancy and Variation in the Mentally Ill.

Sixty State Hospital adult patients of miscellaneous diagnosis and of wide age range were re-examined by means of the Wechsler-Bellevue Intelligence Scales after a mean interval of 13·45 months.

The results obtained indicate a high degree of correlation between the test and retest findings ($r = \cdot 84$). The obtained coefficient compares favorably with the ones obtained on normal adults with different tests, and shows the comparative stability of the test results in patients as well as the high degree of reliability of the scale itself.

A small but consistent gain in the total score as well as in the individual scores of the subtests was observed. A greater increase in score may be noticed in the performance portion of the scale. The recency of the retest is directly related with the magnitude of the gain. Comprehension, Block Design, and Digit Symbol subtests show the greatest and most significant positive changes after a brief interval.

The intra-test patterns measured by means of average deviations from the total test mean does not change appreciably from the test to the retest period.

Further analysis of the results and their correlation with psychiatric and clinical changes as well with the diagnosis is desirable and will be the subject of a future paper.

(Author's abstr.)

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The Neurological Complications of Haemophilia.

The literature relating to the nervous system complications of haemophilia is reviewed. Three cases of haemophilia with neurological complications are recorded: spontaneous cerebral haemorrhage, chronic arachnoiditis from previous subdural and subarachnoid haemorrhage; paralysis of the left femoral nerve and paralysis of the left femoral nerve with massive haemophiliac pseudotumour of the left ilium. S. M. COLEMAN.

Desoxycorticosterone in Epilepsy.

The parenteral injection of desoxycorticosterone acetate was found to afford early protection in experimental epilepsy induced in mice by convulsive doses of cocaine hydrochloride. In two epileptic patients moderate doses, suitable for prolonged administration, failed to show any beneficial effects. S. M. COLEMAN.

Cushing's Syndrome.

Seven cases of Cushing's syndrome with autopsy reports on four are described. The views expressed are in support of the hypothesis that Cushing's syndrome is a hyperadrenocorticalism. S. M. COLEMAN.

Progressive Lenticular Degeneration.

A case of progressive lenticular degeneration, strikingly like those described by Wilson, with asymptomatic hepatic cirrhosis has been followed over a period of nearly three years. Variations in handwriting are shown, alterations in motor symptoms are described and progressive personality changes noted. The diagnosis, made during life, was confirmed by autopsy.

A brief account is also given of a case of known hepatic cirrhosis with the striatal syndrome as a late manifestation. The clinical similarity in these cases tends to confirm the theory that the hepatic condition is probably primary. S. M. COLEMAN.

Cystic Hydrops of the Pineal Gland.

Six cases of cystic hydrops of the pineal body are reported, one of which apparently caused sudden death. Two were associated with mental disorder with death from the suicidal ingestion of poison. Two more reached the age of 60, and collapsed suddenly while apparently in good health. In one of these arterio-sclerosis of the coronary arteries was sufficient to account for a sudden demise of this kind, while the other case remains controversial. The sixth case had a clinical history similar to other reported cases and died under anaesthesia during an exploratory craniotomy. S. M. COLEMAN.

Anorexia Nervosa or Simmonds' Disease?

The following points are considered helpful in differentiating between Simmonds' disease and anorexia nervosa: Instances in young unmarried women are to be considered as anorexia nervosa until proved otherwise. Occurrence in the male sex favours a diagnosis of pituitary cachexia. Occurrence in women with the onset following parturition, particularly if the delivery was associated with much haemorrhage, is strongly suggestive of a true pituitary lesion. Onset following an acute, severe infection suggests true pituitary disease. Loss of axillary and pubic hair occurs much more frequently in Simmonds' disease. Improvement following psychotherapy or adequate food-intake favours a diagnosis of anorexia nervosa. The use of the insulin tolerance test and the urinary 17-ketosteroid assay seem promising. S. M. COLEMAN.

Wartime Ocular Neuroses.

The incidence of these disorders is enormously increased by the psychic trauma of war. They take colour from the combat situation, but the ocular manifestations are the same as those seen in peace time. S. M. COLEMAN.

Obsessive Neuroses.

Obsessive neuroses are important because they provide an intermediary link between the neuroses and the psychoses. The case of a young Army officer is presented. In this case, as in other similar patients, there is a fixation on an anal-sadistic level with severe castration anxiety. Obsessive neuroses tend to develop in very imaginative children who are brought up in families where there is a great deal of strife and tension, so that the children are without any assurance as to the love of either parent for them. Such children resort to fantasy to compensate for this lack of love. They develop unusual ideas about the world around them, and such ideas tend to dominate their psychic life even after they grow up. S. M. COLEMAN.

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*Prevention of Subconvulsive Reactions in Convulsive Therapy for Psychoses. *Ziskind, E. S., and Ziskind, E.* 889
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*Homosexuality, Transvestism and Psychosis. *Liebman, S.* 945
*The " Placing-into-Mouth " and Coprophagic Habits. *Arieti, S.* 959

Prevention of Subconvulsive Reactions.

Modifications in the techniques for both metrazol and electric shock therapy are suggested to insure *grand mal* reactions with initial and subsequent treatments. High initial doses and increase in subsequent doses based on the duration of the " latent period " are recommended. For metrazol, the initial dose suggested is 8 to 11 c.c. intravenously, with subsequent increase of 0·1 c.c. for each second of the latent period in excess of 3 to 5 seconds. For electroshock with the Offner apparatus, the initial dose suggested is 500 m.a. for 0·3 second, adding 10 m.a. in subsequent treatments for each second of " latent period." S. M. COLEMAN.

New Therapy in Dementia Praecox.

Facing the high mortality (80 per cent.) of schizophrenic cases of manifest tuberculosis, it seems possible that thrombi consisting of tubercle bacilli are the cause of the syndrome. It is suggested that the essential factor of shock therapy is the sudden fall and rise of the blood pressure, which aim may be better achieved by direct physiological methods—inhalation of amyl nitrite followed by intravenous injection of adrenalin in sugar-saline-solution.

S. M. COLEMAN.

Homosexuality, Transvestism and Psychosis.

The case reported is that of a definitely hereditarily tainted individual who was reared in a foster home completely removed from his siblings. In this peculiar home situation he became overtly homosexual, transvestitic and psychotic. S. M. COLEMAN.

" Placing-into-Mouth " and Coprophagic Habits.

This " placing-into-mouth " habit, commonly observed in regressed schizophrenics, is compared with similar observations on healthy one- to two-year-old children, and with observations reported by Kluver and Bucy in monkeys after bilateral removal of the temporal lobe. The hypothesis is advanced that such responses are not due to any visual agnosia, but are the expression of a certain level of development at which complex apperceptions elaborating visual stimuli are not yet possible. S. M. COLEMAN.

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Effects of Convulsive Shock.

In curare protected convulsive shock, this study reveals a great variability of the circulatory and respiratory apparatus, both from individual to individual and from treatment to treatment in the same patient. Regarding blood-pressure there is in the clonic phase a rapidly alternating access and recession. These must play a very important role in any brain damage which results from such treatments, since they would place an undue burden upon the adaptive capacity of the intracranial fluid mechanism as well as directly on the vessel walls. Rapid and extreme changes in the pressure effects may also occur in the post-seizure phase. Hence the muscular contractions are not the only source of these phenomena. S. M. COLEMAN.

The Central Nervous System in Diphtheria.

During the height of the illness, a toxic delirium or actual diphtheritic encephalitis may occur. During convalescence, myocardial damage, associated with mural thrombi, is not

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uncommon. Occasionally these cardiac thrombi produce cerebral embolism and a resultant hemiplegia. A clinicopathological study of a case of diphtheritic hemiplegia is presented.

S. M. COLEMAN.

Unusual Types of Anosognosia.

Anosognosia, the condition in which an individual is unaware of his own disease, is a defect in the body image. In this article two unusual cases are reported. The first is a case of anosognosia for hemiballismus. The second gave the opportunity of observing the consecutive development of anognosia for blindness, lack of awareness for auditory sound agnosia, allaechesthesia, anosognosia for left hemiplegia and autotopagnosia. A study of these cases helps to shed light on the common meeting-ground of organic and functional disturbances of the nervous system, the symptoms being closely akin to those experienced by many patients with functional nervous disorders.

S. M. COLEMAN.

The Absolute and the Unconscious.

The difference between Freud and America may be grasped in the difference between the 19th century's biological and necessarily pessimistic theory of the immutable endowments of the human mind, and the American outlook, which has been, from the outset, pedagogically aimed, orientated upon milieu, based on sociology and history, and has always pointed towards optimism.

S. M. COLEMAN.

Pathophysiology of the Infant and Adult.

The hypothesis that the somatic visceral expression of psychosomatic disorders resemble the physiological states of infancy, either as an exaggeration or an accentuation, is presented. With interference in the harmonious functioning of a hierarchy, regardless of etiology of the noxious agent, a reversion or regression to a lower level of functioning in the hierarchy is found.

S. M. COLEMAN.

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Relation of Cerebral Cortex to Spasticity and Flaccidity.

Observations on the state of spasticity or flaccidity have been made in monkeys and chimpanzees following cortical ablations.

1. Primary removal of the various cortical areas has confirmed observations made by previous investigators.

(*a*) Removal of area 6 (including area 4s) was followed by moderate paresis, which is spastic in nature.

(*b*) Removal of area 4 or of the anterior lip of the central sulcus was followed by paresis without spasticity.

(*c*) Removal of the post-central gyrus or of the posterior lip of the central sulcus caused flaccidity, transient and with some paresis. Symptoms were more marked in the chimpanzee than in the monkey.

2. Successive removal of various of these combined areas caused changes as follows:

(*a*) The abolition of areas 4, 4s and 6 either together or seriatim in any sequence resulted in immediate spastic paresis.

(*b*) The addition of the postcentral gyrus to ablation of any areas producing spasticity

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increased paresis. Spasticity was usually increased in the monkeys, although this was not as marked. In the chimpanzees, after a short initial period of marked flaccid paresis, definite spasticity appeared.

(*c*) Combined lesions of area 4 and the postcentral gyrus result in spasticity.

(*d*) The addition of any contra-lateral motor area to a primary lesion causing spasticity increased this spasticity.

(*e*) Removal of an entire hemisphere secondary to ablation of areas 4 and 6 in the monkey augmented the spasticity and paresis to greater degree than did ablation of the postcentral gyrus. (Authors' abstr.)

Acute and Chronic Parietal Lobe Ablations in Monkeys.

1. Removal of area 3, areas 1-2, area 5, and area 7 individually, or of areas 1-2, 5, and 7 in combination, from the parietal lobe of the macaque did not result in paralysis. A loathness for movement was present.

2. Removal of area 3 or of areas 1-2 affected the contralateral arm and leg equally; removal of area 5 affected the leg particularly, and of area 7, the arm particularly. The disturbances are described below. Such a differential localization of them might be inferred from the distribution of the parieto-spinal fibers, which have also been described.

3. Hypotonia was consistently found for as long as a year, but was not present equally in all contralateral muscles, the proximal muscles being more hypotonic. Of those affected in the upper limb, the elevators and abductors of the shoulder, the external rotators of the arm, the extensors of the forearm, the flexors of the wrist and fingers, and the adductors of the fingers were most hypotonic. In the leg, the flexors and extensors of the thigh were about equally affected; the external rotators of the thigh, the dorsiflexors of the foot, and the extensors and adductors of the toes were more hypotonic than their antagonists. The mechanisms underlying this hypotonia have been discussed. Hypotonia probably also accounted for "the paretic posture" at rest and indirectly for ataxia and slowness of movement. Ataxia was not present when the macaques controlled movement by vision.

4. Tendon reflexes were permanently altered by an increase in threshold, a slowness of execution, and an increase of excursion.

5. Appreciation of tactile and painful stimuli was impaired initially after all ablations and for nine months after postcentral lesions. Localization of these stimuli was persistently impossible after all ablations.

6. Proprioceptive placing and hopping and tactile placing were absent immediately after all ablations; the two former reappeared after three weeks, but larger displacements were required. Tactile placing never returned to normal after postcentral lesions, and though it returned after ablation of area 5 or area 7 there was a slowness of response and some uncertainty in its direction. Postcentral gyri appeared essential for tactile placing, and shared with extraparietal cortex the mechanisms involving proprioceptive placing and hopping.

7. The postcentral gyrus appeared essential for the recognition of painful and tactile stimuli; all parietal areas were necessary for the localization and discrimination of these stimuli.

8. Muscle atrophy and hyperpathia were observed in one animal as chronic results of removal of areas 1, 2, 5 and 7 together. (Author's abstr.)

Inhibition of Activity in Single Auditory Nerve Fibers by Acoustic Stimulation.

Further studies by micro-electrodes of the nerve impulses in single auditory-nerve fibers in cats show that the spontaneous discharge which occurs in some fibers in silence can be stopped by certain tones or noises. The tones which inhibit fall into one or more clearly-defined "inhibitory areas" for each fiber, analogous to the "response area" which comprises the tones which excite. For some fibers the inhibitory tones are higher in frequency than the excitatory tones, for others they are lower. Some fibers have inhibitory areas both above and below, while still others fail to show inhibition by pure tones.

The discharge excited by an adequate tone or noise also can be reduced or abolished by the simultaneous presentation of a second tone or noise. In this case the inhibitory areas may encroach upon and overlap the response area. Thus, by simultaneously presenting appropriate second tones which prevent rather than produce discharge in the auditory nerve, it is possible markedly to restrict the range of tones which can excite a given fiber.

The inhibitory action of low tones upon the activity aroused by high tones is much more widespread than the corresponding inhibitory action of high tones upon low tones. A tone as much as five octaves below a high-frequency excitatory tone may inhibit the discharge excited by the high tone.

The mechanism of the inhibition is unknown. Mechanical and electrical factors in the middle and inner ear appear to be excluded as an explanation, nor does it appear to have a reflex basis. It is suggested that nerve fibers underlying the organ of Corti connect widely distant parts of that structure, and that they serve to reduce the excitability of regions distant from the one set in motion by the inhibitory stimulus.

The function of the inhibition is obscure, but it seems probable that in the case of "masking" it plays an important role. The tones which inhibit single nerve-fiber activity in the cat have the same general distribution as those which, in the human subject, are known to be particularly effective as masking tones. (Authors' abstr.)

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The Supernormal Period in the Recovery Cycle of Motoneurons.

1. An analogy between the phenomenon of spontaneous "doubling" in the rhythmic discharge of soleus and triceps motoneurones and bigeminus rhythm in the heart leads to the suggestion that a supernormal period exists in the recovery cycle of these neurones.

2. Procedures known to enhance supernormality in peripheral tissue, namely, acidity and administration of veratrine, increase the frequency with which spontaneous doubling appears, make possible the establishment of "double" rhythms, and permit "tripling" and even perhaps "quadrupling." With veratrine as many as six discharges in rapid series have been counted. Cooling also increases doubling.

3. The various phenomena observed may be explained best by the assumption that the neurones studied recover from a propagated discharge *via* supernormality.

4. The immediate usefulness of supernormality may be to permit the rapid development of muscular tension at the start of reflex activity.

5. The possibility is opened for the existence in the central nervous system of a type of temporal summation based on threshold lowering following a subliminal stimulus (the second phase of summation). (Authors' abstr.)

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The Chemotherapy of Intracranial Infections. IV. The Treatment of Pneumococcal Meningitis by Intrathecal Administration of Penicillin.

The effects of intrathecal administration of penicillin in Type I pneumococcal meningitis have been studied in 96 experiments on dogs.

This method of therapy, even with small dosage, was found to reduce the mortality rate and prolong the survival time.

The beneficial effects of intrathecal therapy were markedly increased by the addition of the intravenous administration of penicillin, since secondary infection of the blood stream was invariably present and lobar pneumonia frequently developed if intravenous therapy were not employed. (Authors' abstr.)

MARCH.

*A Study of Gnosis, Praxis and Language following Section of the Corpus Callosum and Anterior Commissure. *Akelaitis, A. J.* 94
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*The Treatment of Painful Phantom Limb by Removal of Post-central Cortex. *Gutiérrez-Mahoney, C. G.* 156

A Study of Gnosis, Praxis and Language following Section of the Corpus Callosum and Anterior Commissure.

Bilateral seizures can occur even after sectioning the corpus callosum and the anterior commissure. Following complete section of the corpus callosum, there was no disturbance in visual, auditory or tactile gnosis; praxis and language were unimpaired. Orientation was intact. Interhemispheral fibres occur in commissural pathways other than the anterior commissure and corpus callosum, and play a prominent part in the connections between the dominant and subordinate hemispheres. The author found an improvement in emotional status typical of that following bilateral prefrontal lobotomy. G. W. T. H. FLEMING.

The Physiological Basis of Concussion.

Analysis of the clinical manifestations of concussion in the cat, dog and monkey show that they are the result of intense excitation of the central nervous system at the moment of the blow to the head.

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At the moment of concussion a marked electrical discharge occurs within the central nervous system. In the vinethenenovocaine anesthetized animal the cortical activity is increased in frequency following the initial discharge (after-discharge) for 10 to 20 seconds, then decreases until there is little spontaneous activity (extinction). Within several minutes the electroencephalogram becomes practically normal again.

At the moment of a blow on the skull a sudden increase in pressure at the site of impact occurs with pressure waves being transmitted throughout the intracranial cavity.

It is concluded that these mechanical forces produce a breakdown of the polarized cell membranes of many neurones in the central nervous system, thus discharging their axones. This intense traumatic excitation is followed by the same electroencephalographic, chemical and clinical phenomena which characterize intense stimulation of the nervous system by electrical, chemical or other agents. (Authors' abstr.)

The Treatment of Painful Phantom Limb by Removal of Post-Central Cortex.

Phantom limb is a disorder which has an organic basis—a divided peripheral nerve from which stimuli originate and are transmitted through higher levels to conscious registration. The painful phantom can be stopped by interruption of the sensory chain leading to consciousness. Since the peripheral (lower level) pathways are multiple it is simpler to interrupt the chain at the intermediate level by removal of the corresponding part of the post-central cortex. This has been effective in a patient whose operation was done more than two years ago.

(Author's abstr.)

MAY.

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Dark Adaptation, Negative After-images, Tachistoscopic Examinations and Reaction Time in Head Injuries.

1. Light threshold after dark adaptation, latency period for onset of negative after-images, apperception after tachistoscopic exposure, and visuo-motor reaction time were determined in a series of 25 patients with recent head injuries, in 32 patients suffering from prolonged post-traumatic syndromes, and in 25 control subjects.

2. The influence of age, I.Q., severity of the injury, presence of neurological signs, time elapsed since the injury, and personality features on the outcome of these tests are analyzed and discussed.

3. A lengthening period for the onset of negative after-images could be demonstrated for patients with recent head injuries. The acute cases with persistent signs of brain damage had a significantly longer latency period than acute cases without such signs. Apperception after tachistoscopic exposure proved valuable in acute cases, but was not associated with the presence of persistent neurological signs. Light threshold after dark adaptation and reaction time did not show significant differences between acute and chronic patients.

(Author's abstr.)

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Paralysis in Flexion and Tremor in the Monkey following Cortical Ablations.

1. Simultaneous bilateral removal of areas 4s and 6 or of area 6 produced paresis in flexion in four mangabey monkeys.

2. This was associated with reflex grasping and with increased resistance to passive manipulation in all extremities, greater on extension than on flexion.

3. Tremor, coarse and present on movement, occurred as the result of this purely cortical lesion.

4. It is suggested that the reflex flexion pattern is an extrapyramidal release phenomenon, and that it is functionally related to the pattern of reflex grasping. (Authors' abstr.)

Intelligence following Prefrontal Lobotomy in Obsessive Tension States.

1. In forty-five patients with obsessive tension states there was no significant intellectual or emotional deterioration.

2. Disability was not due to the peculiar ideas, but to the emotional charge associated with the ideas.

3. Before prefrontal lobotomy 17 per cent. were usefully employed, and at the present time 67 per cent. are leading useful lives.

4. Pragmatic intelligence is improved by prefrontal lobotomy in individuals disabled by obsessive tension states. (Authors' abstr.)

SEPTEMBER.

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Histologic Studies of the Brain following Head Trauma. IV. Late Changes: Atrophic Sclerosis of the White Matter.

The pathologic alterations in the brains of seven patients surviving head injuries for variable periods of time up to 17 years have been analyzed.

We have been concerned not with the focal changes associated with cerebral cicatrix, but rather with seeking an explanation of diffuse cerebral atrophy noted following many forms of head injury.

Attention is called to the evidence of stasis in the smaller blood vessels, and the associated edema and perivascular hemorrhages, notably in the white matter. We believe that as a result of these circulatory alterations hypoxia develops. In the cases described the circulatory disturbances have been relatively longer lived, and as a result diffuse gliosis of the white matter has developed, since the characteristic reaction of glia to sustained oxygen want of moderate degree is gliosis. That some loss of neuronal elements occurs is true, but the changes are relatively greater in the white matter, which is less well equipped to withstand vascular insults.

The resultant pneumoencephalographic changes are discussed and an explanation sought for them. Diffuse atrophy is thought to be a more significant factor than focal cicatrix in the production of ventricular wandering. (Authors' abstr.)

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The Mental Changes Due to Frontal Lobe Damage.

A critical discussion of the published cases with surgical destruction of one or both frontal lobes (lobotomy) or parts of them (lobectomy) comes to the result that in all cases where, according to the extension of the lesion, changes were to be expected, mental changes occurred. They correspond to those changes which the author has named "impairment of abstract attitude." Whether they come to the fore depends :

1. Upon the tasks which are set before the patient. Deviations from the norm are not seldom overlooked in behaviour in everyday life, because for the solution of these tasks the abstract attitude often does not play an important role. Wherever the patient is confronted with such tasks he fails also in everyday life.

2. Upon the test methods which one applies. Merely such tests which can be solved only by performing the abstract attitude are suitable for revealing the defect.

3. The changes observed in frontal lobe lesions support the idea that there is a particular high mental attitude which may be damaged by lesions of the frontal lobes. It can be impaired also by affections of other parts of the cortex and in diffuse lesions of the latter.

4. The disagreement between authors about the mental changes in frontal lobe lesions is due to differences of the methods of investigation and, with that, evaluation of the facts, anatomical as well as psychological. (Author's abstr.)

Porphyrins, the Nervous System, and Behavior.

The fluorescence spectrum of the white matter of the nervous system shows a well-defined emission band with a maximum at about 625 mμ. This band is absent in the cortex, which exhibits a continuous fluorescence spectrum, and in the meninges of the brain and spinal cord.

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The 625 mμ. emission band has been found to be present in the white matter of 19 species of mammals and birds, including man. It has been found to be absent in seven species of amphibians and reptiles. It is to be assumed that the fluorescence spectrum indicates the presence of one of the fundamental constituents in the white matter of the mammalian and avian nervous system.

The 624 mμ. emission band appears under the influence of exciting light of $\lambda < 470$ mμ. and disappears rapidly under the influence of light.

Under the experimental conditions used, an emission band in the red region remains present in white matter (taken from the brain or spinal cord of freshly killed animals) after boiling in distilled water, after immersion in liquid nitrogen, after several weeks in darkness, and after irradiation with 200 r or 2,000 r of X-rays.

The 625 mμ. emission band is present in the white matter of live animals. Lethal doses of central nervous system poisons or of other compounds (metrazol, mescaline, bulbocapnine, carbon monoxide, etc.) do not cause the disappearance of this band.

Spectrochemical evidence indicates the present of coproporphyrin in the white matter. The evidence is derived from data on solubility, specific HCl number, and fluorescence spectra in different solvents. In addition, varying amounts of protoporphyrin are present.

The fluorescence spectrum as exhibited by white matter appears to be one of Dhéré's Type I.

Spectroscopic data indicate that the post-natal development of the nervous system is characterized by an "ascending porphyrinization." The 625 mμ. emission band is not present at birth. It appears first in the spinal cord and last in the cerebrum. It is definitely present in the spinal cord of rats 20 to 23 days of age and in that of ducks approximately eight weeks of age.

The fluorescence spectra of the cranial nerves exhibit striking differences. For example, the 625 mμ. emission band is present in the optic nerve, but absent in the oculomotor nerve. Similar differences are indicated for other cranial nerves. It seems particularly significant that the optic nerve should contain one of the most remarkable photodynamic substances ever discovered. The 625 mμ. band cannot be detected in spinal nerves or in the sympathetic and spinal ganglia.

The intensity of the 625 mμ. emission band may vary markedly in different animals and in different regions of the same animal. In most mammals the band appears to be less intense in the corpus callosum than in other fibre masses.

The regions of the brain in which the absorption bands of the cytochromes are clearly present are those regions in which the emission bands of porphyrins are absent.

Light may reach the white matter of the brain and especially the optic nerve at illumination levels encountered by mammals and birds in their normal environment.

The biological significance of porphyrins is considered in relation to comparative and developmental data.

Previously published data indicate two lines of evidence to suggest that porphyrins may play a decisive role in altering and influencing psychic functions: (*a*) the appearance of nervous and mental symptoms in cases of so-called acute porphyria; (*b*) the results which have been obtained by using hematoporphyrin as a therapeutic agent in the psychoses.

The results reported in the present study, if related to certain facts and considerations in the literature, suggest the possibility that certain neurological and psychiatric disorders may be due to or associated with a "cerebral porphyria," or a disturbance of the metabolism of certain pyrrol compounds in the nervous system.

Three lines of research demand immediate attention: (*a*) a spectroscopic, spectrochemical, and chemical study of brains and spinal cords of patients with various neurological and psychiatric disorders to determine the distribution, amounts and kinds of porphyrins present in the nervous system; (*b*) a study of various neurological and psychiatric disease groups to determine the effects of such factors as are known to influence the porphyrins or the pyrrol metabolism of the organism; (*c*) microscopic examination, including the use of fluorescence microscopy and the application of microspectroscopic techniques of the nervous tissues of patients from various neurological and psychiatric disease groups, to determine the possible presence and distribution of porphyrins and related pigments in the nervous system.

The hypophysis differs strikingly from the brain and spinal cord by exhibiting a special affinity for porphyrins introduced into the body, although normally it contains no appreciable amounts of porphyrins. (Author's abstr.)

OCTOBER.

A Critical Evaluation of Two Aspects of the Army Specialised Training Program in Basic Engineering. *Shuttleworth, F. K.* 159
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The Effect of the Administration of Sodium Bromide to Pregnant Rats on the Learning Ability of the Offspring. III. Three-table-test.

1. The 3-table-test which measures nervous processes of a higher order than those required for maze-learning has been used to detect functional damage in rats produced by the prenatal administration of sodium bromide.

2. Four groups of Wistar albion rats were used: the control group made up of offspring of normal mothers, and three experimental groups composed of rats whose mothers had been dosed with 40, 80, and 120 mgm. per kgm. of body weight per day of sodium bromide, respectively, from the third through the twentieth day of gestation.

3. Using as criteria Maier's formula for the number of animals "passing" the test, and also the error scores and the time scores, all of the bromide groups made poorer scores than the control. In general, on the basis of error and of time scores, the differences between the control and the bromide groups were significant, but this was not true of the differences among the bromide groups.

4. The standard deviations of the groups computed on both the error and time scores show that the control group is less variable than the bromide groups.

5. All of the groups were free from abnormal amounts of bromide at 60 days of age and probably long before, hence, the 3-table-test applied at 106 to 124 days serves as a measure of the persistence of the damage as well as a quantitative evaluation. (Authors' abstr.)

A Study of the Reliability of the Goodenough Drawing Test of Intelligence.

The Goodenough Drawing Test of Intelligence was given to 136 third and fourth grade children on two occasions a week apart. Each drawing was scored three times by well-trained examiners, twice by the same scorer, and once by a different scorer.

Data were thus secured for the study of the reliability of the scale from the following aspects: (*a*) the scorers' agreement with themselves when rescoring the same drawings, (*b*) the scorers' agreement with each other on the scoring of identical drawings, (*c*) the children's consistency of performance over an interval of one week when scorer was constant, and (*d*) the odd-even method. The first three types of analysis are presented according to the correlational technique and also by tabulations of obtained differences in raw scores. In general the results indicate that:

1. In spite of a composite scorer self-consistency correlation of + ·94, and in spite of the fact that scorers' inconsistencies tend to cancel in the treatment of group data, discrepancies in the same examiners' rescoring of identical drawings amount to as much as a year or more of normal age in 12·4 per cent. of the cases.

2. The average interscorer correlation obtained when two examiners scored identical drawings was + ·90. Even with as high an agreement coefficient as this, discrepancies in scores assigned to identical drawings by two different scorers, who had had identical training on the test, amounted to a year or more of mental age in 25·3 per cent. of the cases.

3. The correlation between scores on two drawings done a week apart by the same children when both drawings by each child were scored by the same person was + ·68. Under these conditions mental age changed one year or more in 41·7 per cent. of the cases.

4. The odd-even reliability of the scale was + ·89 when corrected with the Spearman-Brown Prophecy formula.

5. Although the many advantages of this scale are recognized, the present study indicates the need for caution in the use of the scale for individual diagnosis, because of the subjectivity of the scoring, and because of the frequency of marked variability in individual performance over short intervals, and the possibility of individual variation from time to time being affected by immediately preceding activities, affective states, and mental content.

(Author's abstr.)

An Experimental Study of Bromism.

Serum bromide levels averaging 142 mgm. per 100 c.c. were achieved in the course of four weeks of bromidization in 78 normal subjects through the administration of 50 mgm. of sodium bromide per kilogram of body weight. The dosage was adjusted from time to time to assure levels between 100 and 200 mgm. per 100 c.c. In 20 psychotic patients a mean level of 134 mgm. per 100 c.c. was reached after six weeks of medication.

The normal subjects showed no symptoms of either bromide psychosis or intoxication, but merely the effects of sedation. This was manifested largely in sounder and increased sleep and in some loss of concentration consequent upon the relaxation brought about in sedation. These subjective findings were borne out by objective psychological tests. These findings must be restricted to normal subjects and to the bromide concentrations observed in this study. True bromodermas were observed in two subjects only.

Of the 20 psychotic subjects only two showed evidence of mild intoxication, while the others showed only sedation and even some clinical improvement. On the whole, psychotic subjects of the type studied here may be somewhat more susceptible to bromide effects than normal subjects showing even somewhat higher bromide levels than the patients.

A group of 28 psychotic patients was given 75 to 100 mgm. of sodium bromide per kilogram body weight daily for six to eight weeks. These patients reached a mean serum bromide level of 228 mgm. of 100 c.c., with a maximum of 310 mgm. In this group 57 per cent. of the subjects showed some signs of bromide intoxication, such as ataxia, fixed pupillary reactions to light, and

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very marked drowsiness. There was, however, no considerable exacerbation of the psychotic symptoms.

The indications of the experimental study are that normal individuals are not liable to develop toxic symptoms at serum bromide levels between 100 and 200 mgm. per 100 c.c., and that mental hospital patients with long hospitalization are only slightly more susceptible to bromide effects at comparable levels. At bromide levels between 200 and 200 mgm. per 100 c.c., however, mental patients of the same type show definite signs of intoxication, but little if any exacerbation of their psychotic symptoms. (Authors' abstr.)

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1. Biochemistry, Physiology, Anatomy, Pathology, etc.

Study of the Chemistry of the Blood and Cerebrospinal Fluid in Air Concussion. Zakharov, N. V. [*Klin. Med.* (*U.S.S.R.*), **21**, *No.* 10/11, 55–7 (1943).]

Electrolyte distribution is changed. The K/Ca coefficient is lowered. The K content drops with relatively constant Ca level. Sugar, Cl, residual N and cholesterol remain essentially normal. G. M. KOSOLAPOFF (Chem. Abstr.).

Modification in the Correlation between Na and Cl in the Cerebrospinal Fluid, Blood and Urine in Closed Injury of the Skull. Abramtseva, Z. M. [*Klin. Med.* (*U.S.S.R.*), **21**, No. 10/11, 47–52 (1943).]

Generally there is observed the shift of Na/Cl coefficient showing a degree of retention of Na. In blood the coefficient is generally decreased. In cases of strong Na retention there is decrease of Na elimination in urine. Hypertension may be explained on this basis as being due to swelling and edema of the brain tissue with disturbance of the Na content.
G. M. KOSOLAPOFF (Chem. Abstr.).

A Method for Determining Cerebrospinal Fluid Protein by the Photoelectric Colorimeter. Cipriani, Andre, and Brophy, Doris. [*J. Lab. Clin. Med.*, **28**, 1269–72 (1943).]

A simple and rapid method for the determination of protein in 1 c.c. of fluid is presented. A miniature attachment for the Evelyn photoelectric colorimeter for the use of small pyrex test-tubes is described. False high results with colored specimens are averted by corrections made with the use of a blank of water and spinal fluid. H. W. ROBINSON (Chem. Abstr.).

A Colloidal Cu Reaction in the Cerebrospinal Fluid in Uremia. Linder, Geoffry C. [*Am. J. Clin. Path.*, **14**, 380–5 (1944).]

The cerebrospinal fluid from some cases of uremia gives a characteristic and unusual type of reduction when tested for sugar with the qualitative Benedict reagent or Fehling's solution. The Cu_2O remains in colloidal solution instead of being deposited as a precipitate. This "colloidal Cu" reaction is due to the presence of creatinine in the fluid in a concentration exceeding 5 mgm. per 100 c.c. of fluid, and this will occur only when the blood creatinine exceeds 10 mgm. per cent. Very rarely the same reaction is found in turbid meningitic fluids. The substance responsible has not been identified, but it is not creatinine or lactic acid. A positive colloidal Cu reaction is of the gravest prognostic import. JOHN T. MYERS (Chem. Abstr.).

The Effect of Anoxia on the Pressure of the Cerebrospinal Fluid and on the Rate of Absorption of Normal Saline Solution from the Subarachnoid Space of Dogs under Ether Anesthesia. Bedford, T. H. B. [*J. Physiol.*, **102**, 334–40 (1943).]

There is no appreciable deviation from normal. H. L. WILLIAMS (Chem. Abstr.).

The Relation between the Pandy Test and Total Protein Content of Spinal Fluid. Madonick, M. J., and Savitsky, Nathan. [*J. Lab. Clin. Med.*, **29**, 542–5 (1944).]

The relationship between the Pandy test and the total protein in spinal fluid was determined. Records of 1,000 neurologic admissions to a hospital were examined with reference to this relation. Fifty-nine had negative Pandy tests with a total protein of 50 mgm. per 100 c.c. or over. Eighty-three had a positive Pandy reaction with a total protein of 100 mgm. per 100 c.c. or over. It was observed that about half the cases began to show a positive Pandy test when the protein level was 70–75 mgm. per 100 c.c. The results indicate that a negative Pandy may exist with a total protein above 50 mgm. per 100 c.c. The data support those investigators who claim the total protein may be increased despite a negative Pandy reaction. Three tables contain the experimental results obtained, and the literature on the subject is critically reviewed.
R. J. ALLGEIER (Chem. Abstr.).

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The Determination of the Protein in Cerebrospinal Fluid by the Biuret Method. Andersch, Marie A. [*Am. J. Clin. Path., Tech. Sect.*, **8**, 43–6 (1944).]

The Kingsley biuret method (*C.A.*, **34**, 125[9]) for plasma proteins is applied to spinal fluid. To 1·0 c.c. of biuret reagent (to 500 c.c. of 42 per cent., CO_2-free NaOH add 100 c.c. of 3 per cent. $CuSO_4$), add 2·0 c.c. of spinal fluid. Read within 10 minutes in a photo-electric colorimeter and compare with a calibration curve prepared from standard protein solution. The method is accurate for protein concentrations from 100–500 mgm. per cent. It can be applied directly to xanthochromic fluids. JOHN T. MYERS (Chem. Abstr.).

A Note on the Measurement of Protein in Cerebrospinal Fluid by the Biuret Method. Sunderman, F. Wm., and Schmidt, Pauline. [*Am. J. Clin. Path., Tech. Sect.*, **8**, 47–8 (1944).]

Results with the Kingsley method (*C.A.*, **34**, 4093[7]) compare well with the determination of total N and non-protein N by the Pregl method. JOHN T. MYERS (Chem. Abstr.).

Interdependence of Biological and Physicochemical Properties of the Cerebrospinal Fluid and Man's Emotional State. Lokshina, E. S., and Efimov, V. V. [*Byull. Eksptl. Biol. Med.*, **14**, No. 1, 11–15 (1942).]

There exists a close relationship between the functional condition of the central nervous system and the composition and properties of the cerebrospinal fluid. In many cases of severe depression there are observed in the fluid lowering of surface tension, changes in biological activity of a parasympathomimetic character. The opposite mental state is accompanied by predominance of biological activity of sympathomimetic character.

G. M. KOSOLAPOFF (Chem. Abstr.).

The Phosphatase Content of Normal and Pathological Cerebrospinal Fluid. Albers, D. [*Fermentforschung*, **17**, 1–7 (1942); *Chem. Zentr.*, **1**, 2208 (1943).]

Cerebrospinal fluid from normal persons or from those with disease not involving the brain, spinal cord or meninges shows either none or a very small quantity of alkaline phosphatase (β-glycerophosphate; pH = 8·9; 24–72 hrs., 37°). The inflammatory diseases of the central nervous system behave differently. The majority of cases of epidemic and tuberculous meningitis show a considerably stronger enzyme activity. In meningitis serosa not arising after an infectious disease, the enzyme content is slight, with one exception. The phosphatase content is generally normal in disease of the brain and spinal cord in which the serosa membranes are not involved. J. MAX LITTLE (Chem. Abstr.).

Decrease of Surface Tension of the Cerebrospinal Fluid by Inactivation and by the Presence in it of the Lipoprotein Molecular Complexes. Efimov, V. V. [*Byull. Eksptl. Biol. Med.*, **14**, No. 1, 108–11 (1942).]

On inactivation and boiling, the surface tension of cerebrospinal fluid (in man and dog) is usually lowered, especially on the benzene interface. It is possible that the fluid contains lipoprotein molecular complexes analogous to those found in blood serum.

G. M. KOSOLAPOFF (Chem. Abstr.).

Surface Tension of the Cerebrospinal Fluid, Blood and Brain Metabolites at the Air and Liquid Interfaces. Efimov, V. V., and Lokshina, E. S. [*Byull. Eksptl. Biol. Med.*, **13**, No. 5/6, 40–3 (1942).]

The interfacial tension between cerebrospinal fluid and benzene is lower than the surface tension in air. Surface tension can be used to study changes in cerebrospinal fluid.

G. M. KOSOLAPOFF (Chem. Abstr.).

Thorotrast in Neurologic Diagnosis. Freeman, Walter, Schoenfeld, Herbert H., Watts, James W., and Groh, Robert H. [*Trans. Am. Neurol. Assoc.*, **67**, 89–91 (1941).]

During 7 years' clinical experience the authors have found stabilized ThO_2 suspension (Thorotrast, I) useful as a contrast agent for X-ray examination of the nervous system (ventriculography, cerebral angiography, myelography, and visualization of brain abscesses and cysts) in cases in which air has proved unsatisfactory. In normal persons (I) is eliminated from the cranium in 4 hours and produces only mild inflammation. Because (I) has a high specific gravity and is freely miscible with cerebrospinal fluid, it penetrates to the dependent part of the ventricular system and gives an unusually clear picture of the aqueduct of Sylvius and the 4th ventricle. In persons with ventricular obstruction, severe suppurative ependymitis is produced by (I) remaining in the ventricle; such a reaction was fatal to one patient. Severe reactions have been prevented by withdrawing (I) immediately upon completion of roentgenography. Patients observed up to 3 years after ventriculography have shown no evidence of progressive granulomatous process consequent to the initial ependymitis. Myelography with (I) has proved useful in demonstrating protruded intervertebral disks; approximately 90 per cent. of 10 c.c. of (I) injected can be recovered by spinal drainage. If (I) is injected in small amounts and allowed to remain in the subarachnoid space, the colloidal suspension is broken down, and ThO_2 particles are deposited in the pia arachnoid and carried along the perineural lymphatics. Meningography and neurography with (I) have been employed only to a limited extent; their clinical value is not yet proved. MARION HORN PESKIN (Chem. Abstr.).

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The Sensitivity of the Respiratory Center of H-ion Concentration. Banus, M. Garcia, Corman, Harvey H., Perlo, Vincent P., and Popkin, Geo. L. [*Am. J. Physiol.*, **142**, 121–30 (1944).]

The ability to compensate for a gradually increasing acidosis due to intravenous injections of HCl or lactic acid was tested in anesthetized dogs deprived of their chemoreceptor reflexes by denervation of the carotid sinus region and by section of both vagus nerves.

E. D. WALTER (Chem. Abstr.).

Specificity in the Effects on Brain Metabolism of Two Differing Neurotropic Viruses. Nickle, Margaret, and Karat, Herman. [*J. Exptl. Med.*, **80**, 247–55 (1944).]

Brain tissue with the virus of Western equine encephalomyelitis shows specific differences in metabolism from brain tissue infected with the virus of poliomyelitis. With added glucose (I) concentration of 121 mgm. per cent. O utilization of poliomyelitic brain (II) is significantly below normal and that of encephalitic brain (III) is not; with added (I) concentration of 217 mgm. per cent. O utilization of (III) is significantly below normal and that of (II) is not. With lactate-(I) as the substrate, O utilization of (II) is below normal and that of (II) is not. With pyruvate-(I) as substrate, neither (II) nor (III) differs significantly from normal in O consumption. With succinate-(I) as substrate, O utilization of (II) is significantly above that of the normal control in the 1st hour. With added (I) concentration of 37·5 mgm. per cent. anaerobic metabolism of (III) is significantly below the normal, whereas that of (II) is not; with added (I) concentration of 229·5 mgm. per cent. the anaerobic metabolism of both (II) and (III) is significantly below the normal.

C. J. WEST (Chem. Abstr.).

Action of KCl on the Nerve Endings of Skeletal Muscle. Udenich, N. A. [*Byull. Eksptl. Biol. Med.*, **17**, *No.* 1/2, 44–8 (1944).]

Action of KCl (0·015–0·02 per cent. solutions) causes a definite change in activity of neuromuscular specimens. The magnitude of muscular contraction on individual stimuli gradually drops. The irritability threshold rises only toward the state of non-conduction between nerve and muscle. Duration of refractory state up to complete absence of conduction does not change and, in some experiments, is shortened.

G. M. KOSOLAPOFF (Chem. Abstr.).

Water Metabolism in Relation to Convulsions. II. The Specific Gravity of the Blood and the Blood Serum. Stone, Theodore T., Arieff, Alex J., and Luhan, Joseph A. [*Trans. Am. Neurol. Assoc.*, **68**, 177–9 (1942). *See C.A.*, **36**, 6637[1].]

MARION HORN PESKIN (Chem. Abstr.).

Experimental Studies on Brain Edema. Penfield, W., Prados, M., and Strowger, B. [*Trans. Am. Neurol. Assoc.*, **69**, 106–8 (1943).]

When one hemisphere of the cat brain is exposed to air for several hours and the wound then closed, the electroencephalogram shows depression of cortical activity for a few days, and the brain tissue undergoes hemorrhagic changes and edema. These effects are prevented by intramuscular injection of 2–5 c.c. adrenal cortex extract one hour before exposure of the brain, and again after closure of the wound and during the following days, or by administration of anterior pituitary corticotropic extract.

MARION HORN PESKIN (Chem. Abstr.).

Certain Peculiarities of Metabolism in Epilepsy. Palladin, A. V., Soreni, D. T., and Khalkina, B. I. [*Byull. Eksptl. Biol. Med.*, **17**, *No.* 1/2, 31–4 (1944).]

Epileptics show wide fluctuations of blood sugar. In most cases loading with sugar produces a normal "loading curve" or a two-phase loading curve. When seizures coincided with the curve rise, it was observed that the curve drops immediately before the seizure and rises rapidly immediately after the seizure. N metabolism is shown to be disturbed after a seizure and sometimes before one; it is shown by the rise of residual N (blood). Intravenous introduction of ammonium carbonate solution to cause a seizure leads to a paradoxical drop of residual N and urea (blood) during and immediately after a seizure. The cerebral permeability barrier to N fractions either disappears or is greatly lowered in seizure.

G. M. KOSOLAPOFF (Chem. Abstr.).

Effect of Diathermy on Brain Metabolism: Changes Produced on Sugar, Lactic Acid and pH of Arterial and Venous Blood of the Brain in Paretic Patients. Looney, Joseph M., and Borkovic, Embrie J. [*J. Lab. Clin. Med.*, **28**, 983–7 (1943); *cf. C.A.*, **36**, 2931[6].]

There was no change in sugar utilization and an increase in pH. The lactic acid arteriovenous difference is reversed, so that during the period of continued temperature elevation, lactic acid is produced. There is no increase in brain metabolism during diathermy.

B. C. P. A. (Chem. Abstr.).

Sex Hormones and Nerve Function. Chauchard, Paul. [*Ann. d'endocrinol.*, **4**, 133–4 (1943); *Chem. Zentr.*, **2**, 1721 (1943).]

Chronaximetric measurements on guinea-pigs are reported. After intraperitoneal injection of 2–4γ of folliculin, 100γ testosterone or 500γ progesterone per 500 gm. of animal the chronaxie phenomena are influenced almost at once. Therefore one is dealing with a direct influence on the nerve cells. All three hormones have a depressive action on the brain. Similar activity is also obtained with provitamin D_2 and desoxycorticosterone. The conditions in pregnancy require investigation.

IVAN A. WOLFF (Chem. Abstr.).

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Photochemical Experiments on Single Nerve Fibers. Hutton-Rudolph, M. [*Helv. Physiol. Pharm. Acta*, **1**, C15–19 (1943).]

Exposure of an internodal piece of a single motor nerve fiber in frogs to ultraviolet rays lowers the rheobase to 50–200 mv. (controls 100–500 mv.), reaching its lowest value after 2 minutes. This phase of hyperexcitability is followed by a rapid increase of the rheobase until the fiber becomes unexcitable after 11–15 minutes' exposure. Unexcitability occurs more rapidly if a node of Ranvier is exposed. This is prevented if the rays below 300 mμ. are filtered through a quartz cuvette with aneurin (1 : 100). Exposure to light above 300 mμ. has no effect on the rheobase. B. C. P. A. (Chem. Abstr.).

Effects of Desoxycorticosterone Acetate on Water and Electrolyte Content of Brain and Other Tissues. Ziegler, Mildred, Anderson, J. A., and McQuarrie, Irvine. [*Proc. Soc. Exptl. Biol. Med.*, **56**, 242–4 (1944); *cf. C.A.*, **38**, 5257⁹.]

Young rats were given daily subcutaneous injections of 1 mg. of desoxycorticosterone acetate (in sesame oil) for 1–6 weeks. The K of the brain and skeletal muscles decreased about 20 per cent. while the Na increased very slightly. Heart muscle K was not affected, but liver K decreased about 30 per cent. There was no significant change in the water content of the tissues examined. Whether or not the antiepileptic effect of the hormone, previously reported, is in any way related to the decrease in brain K is not known.

L. E. Gilson (Chem. Abstr.).

Site of Action of Indole in the Central Nervous System. Feinberg, I. M., and McCulloch, W. S. [*Proc. Soc. Exptl. Biol. Med.*, **56**, 193–4 (1944).]

Experiments with dogs and cats show that intravenously injected indole can act on many portions of the central nervous system, but that the characteristic motor seizure produced is of subcortical and sometimes of spinal origin. L. E. Gilson (Chem. Abstr.).

The Nature of Synaptic Transmission in a Sympathetic Ganglion. Eccles, J. C. [*J. Physiol.*, **103**, 27–54 (1944).]

Eserine has little or no action on the synaptic potentials which single or double preganglionic volleys set up in the curarized stellate ganglion cells. The synaptic potentials produced by preganglionic tetani are changed in only one respect by eserine—the addition of a very prolonged potential built up during the stimulation, and, on cessation of stimulation, long outlasting (by several seconds) the decaying phase of the normal synaptic potential, which can still be observed superimposed on it. Eserine has no appreciable action on the ganglionic after-potentials set up by antidromic stimulation, but, as in the curarized ganglion, it greatly lengthens the superimposed synaptic potential set up by preganglionic stimulation. Hence, summation is observed with much slower rates of stimulation, and there is a greatly prolonged (10 seconds or more) and intensified after-discharge with even less than 1 second tetanization. Analysis of the synaptic potential, according to the local-potential theory, shows that the eserine effect is due to the production of a prolonged transmitter action without modifying the "peak" and "tail" transmitter actions normally present. This prolonged action is due to acetylcholine, which is rapidly removed by cholinesterase normally. The properties of the "tail" action show it to be due to a substance liberated by preganglionic stimulation, but not removed by cholinesterase. On the other hand, the brief "peak" action accords well with the direct electrical excitatory effect produced by the action currents of the preganglionic impulses.

H. L. Williams (Chem. Abstr.).

Metabolism of Phosphate and Carbohydrate in Extracts of Human Muscle and Brain. Greville, G. D., and Lehmann, H. [*J. Physiol.*, **102**, 357–61 (1944).]

The following four reactions have been shown to take place in cell-free extracts of human muscle: Adenosine triphosphate → adenosine diphosphate and phosphate, glycogen and phosphate → hexose monophosphate, hexose diphosphate ⇌ 2 triose phosphate, and adenosine triphosphate (adenosine diphosphate) and creatine ⇌ adenosine diphosphate (adenylic acid) and creatine phosphate. Specimens were obtained of human normal voluntary muscle during operations under spinal anesthesia for various surgical conditions, and included rectus abdominis, oblique abdominis, pyramidalis and cremaster. All four reactions were demonstrated in at least two specimens. Three samples of normal brain tissue, mainly cortex from the frontal lobe, two during prefrontal leucotomy and one during the removal of an intracranial tumor, yielded extracts which exhibited the last two reactions. A single sample of uterus sufficiently free from fibroid degeneration to be used was used to demonstrate the presence of the third reaction. These data are thought to constitute the first report of these reactions in human voluntary muscle, brain cortex and uterus muscle extracts.

H. L. Williams (Chem. Abstr.).

The Effect of Temperature and Ions on the Impedance of Unstriated Muscle and its Relation to Permeability and Excitability. Singh, Inderjit, and Singh, Mrs. Sunita Inderjit. [*Proc. Indian Acad. Sci.*, **19B**, 130–46 (1944).]

The electrical resistance of dog and frog stomach muscle and frog rectus abdominis was

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determined by a Wheatstone bridge. Ag and Pt electrodes were used. Those factors found to decrease resistance were: increasing temperature; anions in increasing order, Cl, Br, NO_3, I, SCN; high ionic concentration. Factors which increased resistance include: compression; H ions; cations in increasing order, Li, Na, NH_4, K, Ca. Permeability is diminished in smooth muscle by Ca, H ions, and the previously listed anions. The resistance and permeability of smooth muscle are greater than those of striated muscle. A. EDELMANN (Chem. Abstr).

Dextrose Tolerance Tests after Cerebral Injury. Roth, H. [*Schweiz. med. Wochschr.*, **73**, 865–7 (1943).]

Elevated dextrose tolerance occurred among 45 patients with cerebral injuries. The usual number of tests performed on each patient was four. This disturbed carbohydrate metabolism is considered an impairment of sympathetic nervous centers. The degree of elevation of blood-sugar level did not parallel the severity of the cerebral lesion. A normal blood-sugar tolerance curve, provided the tolerance test is made not later than the third day, was considered as ruling out a traumatic cerebral lesion. The duration of the elevated tolerance levels, rather than the height of the curve, indicated the severity of the lesion. MAURICE M. RATH (Chem. Abstr.).

Etiology of the Migraine Syndrome. Pfeiffer, Carl, Dreisbach, Robert H., Roby, Charles C., and Glass, Howard G. [*J. Lab. Clin. Med.*, **28**, 1219–25 (1943).]

Data are presented which justify separation from the so-called "common headache" of two new types, namely, relaxation headache and "caffeine-withdrawal headache." The former is accompanied by a decreased blood volume, and the latter by an increase in the "effective arterial blood volume." No consistent blood-electrolyte changes occur with relaxation or migraine headache. The migraine syndrome is accompanied by relative hemoconcentration.
B. C. P. A. (Chem. Abstr.).

Chemical Steps in the Metabolism of Alcohol by Brain in vitro. Dewan, John G. [*Quart. J. Studies Alc.*, **4**, 357–61 (1943).]

Minced cow brain *in vitro* formed AcH (I) and AcOH (II) from EtOH (III). The oxidation of (III) to (I) in brain, as in liver, is probably catalyzed by a specific dehydrogenase plus a series of enzymes, two of which contain nicotinic acid and riboflavin. (I) can then be directly oxidized to (II) by aldehyde oxidase and/or may be subjected to dismutation to (II) and (III) by the aldehyde mutase of Dixon and Lutwak-Mann (*C.A.*, **31**, 8569[1]; **33**, 6353[7]).]
MARION HORN PESKIN (Chem. Abstr.).

Phosphoaminolipides of Brain Tissue. Fractionation and Estimation of Choline-containing Substances. Carayon-Gentil, Mme. A., and Corteggiani, E. [*Bull. soc. chim. biol.*, **24**, 89–96 (1942); *Chem. Zentr.*, **2**, 1742 (1943).]

Extract 100 gm. of fresh brain pulp three times with Me_2CO at 6° for 2–5 hours; use a total of 900–1,000 c.c. of Me_2CO and add 1 gm. of $MgCl_2$ to each of the first two portions of solvent. The extract contains the free choline. Powder the dry tissue residue and extract 6–8 hours with petroleum ether, b. 30–5°, in a Soxhlet apparatus. This extract contains the lecithin and cephalin. Extract the residue next with MeOH-$CHCl_3$ mixture (3 : 1) in a Soxhlet apparatus. The extract contains the sphingomyelin. Hydrolyze each of the three extracts by boiling with alcohol HCl and estimate the choline in each by the method of Mentzer (acetylation and estimation of the acetylcholine formed by its action on leech muscle). For purpose of calculation the molecular weight of lecithin is taken as 791 and that of sphingomyelin as 832. Fresh beef brain contained, according to this procedure, 6–29 mgm./gm. of free choline, 8–15 mgm./gm. of lecithin and 5·8–6·3 mgm./gm. of sphingomyelin. L. E. GILSON (Chem. Abstr.).

Action of Ca Galactogluconate upon the Medulla and Spinal Cord. Frommel, E., and Wolfermann, A. [*Schweiz. med. Wochschr.*, **72**, 1205–7 (1942).]

Simultaneous injection of Ca galactogluconate prevented epileptiform convulsions in guinea-pigs produced by injection of 0·20 to 0·35 gm. coramine per kgm. body weight. Administered after the respiratory center in rabbits had been stimulated by coramine or depressed by morphine, Ca galactogluconate had no effect. MAURICE M. RATH (Chem. Abstr.).

Effects of Administered Pregnenolone on Fatiguing Psychomotor Performance. Pincus, Gregory, and Hoagland, Hudson. [*J. Aviation Med.*, **15**, 98–115, 135 (1944).]

Each of five healthy male students exhibited improved performance scores upon the Stevens serial co-ordination meter when 57 mgm. Δ^5-pregnenolone was administered orally daily for seven days during the tests. Oral cortin, injected progesterone and placebo administration were not accompanied by such score improvement. Seven instructor pilots tested on the Hoagland-Werthessen pursuit meter were given alternately placebos, 50 mgm. pregnenolone daily and placebos. A significant improvement in absolute score, in decrement measures and in "emergency performance" occurred during pregnenolone administration.
MAURICE M. RATH (Chem. Abstr.).

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The Nature of Myasthenia Gravis. Stoerk, Herbert C., and Morpeth, Elvira. [*Science*, **99**, 496–7 (1944).]

No significant differences in the amount of acetylcholine synthesized were obtained regardless of whether thymus or serum from patients with myasthenia gravis were added to the medium (minced rat brain). Likewise no significant differences in the amounts formed were obtained in Locke solution or in human serum. E. D. WALKER (Chem. Abstr.).

Comparative Studies of the Rates of Oxidation and Glycolysis in the Cerebral Cortex and Brain Stem of the Rat. Chesler, Annette, and Himwich, Harold E. [*Am. J. Physiol.*, **141**, 513–17 (1944).]

An attempt is made to estimate the calcium obtainable aerobically and anaerobically by the brain. E. D. WALTER (Chem. Abstr.).

Influence of the Cerebellum on the Sugar Content of the Blood. Wiggers, K. [*Arch. néerland. physiol.*, **27**, 304–25 (1943).]

On removal of the uvula cerebelli the amplitude of the variations in the fasting blood-sugar level increases. Glucose given *per os* increases the blood-sugar content more markedly in animals, in which the uvula has been removed, than in normal animals. Thus, in contrast to Kaplan's results (*cf. C.A.*, **36**, 7099[7]), the influence of the cerebellum on sugar metabolism is localized. This influence is of a regulatory nature and differs from that of the labyrinth. Excitation of the latter and of its nuclei causes a change in the fasting blood-sugar level, which is not modified by electrical stimulation of the cerebellum. Microscopic examination also confirmed the assumption that the influence of the cerebellum on the blood-sugar level is localized in the uvula. T. LAANES (Chem. Abstr.).

Naturally Occurring Porphyrins in the Central Nervous System. Klüver, Heinrich. [*Science*, **99**, 482–4 (1944).]

The fluorescence spectrum of the white matter of the central nervous system, in numerous animals, shows an emission band at 630–620 mμ., with a maximum at about 625 mμ. It is suggested that the porphyrins may play a role in neurological and psychiatric disorders.
E. D. WALTER (Chem. Abstr.).

Ameboid Motion and Secretion of Motor End Plates. III. Experimental Histopathology of Motor End Plates Produced by Quinine, Curare, Prostigmine, Acetylcholine, Strychnine, $PbEt_4$, and Heat. Carey, Eben J. [*Am. J. Path.*, **20**, 341–94 (1944); *cf. ibid.*, **18**, 237–89 (1942).]

The aurophilic granules of Kühne, the secretion of which is correlated with ameboid motion of motor end plates, may be increased in quantity by curare and quinine. These chemicals also block neuromuscular transmission and cause the aurophilic epilemmal and hypolemmal axons to undergo acute dilatations. The secreted granules of Kühne may be decreased in number and even completely by prolonged chemical stimulation, such as that produced by strychnine, NaCN, CO_2 and exhausting muscular exercise. The terminal expansions of the hypolemmal axons of the end plate may undergo direct transformation into the secreted granules of Kühne, without the presence of the intervening clear space, by sudden stimulation with either prostigmine or acetylcholine after the end plate has been blocked by the local action of curare. Heat produces a sudden expansion of the end plate and a dispersal of the granules of Kühne that together produce perturbations in the pattern of the cross striations of the muscle fiber. $PbEt_4$ produces a sudden and explosive transmission of an abnormal quantity of aggregates of aurophilic granules which results in massive radiations, distortion and increased staining capacity of the end plates for Au, as well as abnormal distortions of the related cross striations of the muscle fiber to these abnormal end plates. F. B. SEIBERT (Chem. Abstr.).

Action of Phosphate Injections into the Brain of Mice. Biocca, E. [*Arquiv. biol.* (*São Paulo*), **27**, 21 (1943) (*English summary*).]

Intracerebral injection of Sörensen buffer solution of phosphates (pH 7–7·5) produces in mice a generalized and prolonged contraction of muscles, sometimes followed by death.
F. FROMM (Chem. Abstr.).

The Autolysis of Brain Infected with Rabies. Ionescu, Dimitrie. [*Zentr. Bakt. Parasitenk., I Abt.*, **151**, 21–5 (1943).]

At 18° in the dark, rabic brain retains its virulence for four months. The Negri bodies remain but the brain cells disintegrate. Autolysis is slower than with normal brain. At 37° in the dark, at a pH of 7·1, virulence was retained for nine days and the Negri bodies were larger than before autolysis. JOHN T. MYERS (Chem. Abstr.).

Water, Nitrogen and Electrolyte Concentration in Brain (of Dog). Eichelberger, Lillian, Richter, Richard B., and Roma, Michael. [*J. Biol. Chem.*, **154**, 21–9 (1944).]

Analytical data are reported on brains from 22 normal dogs, 5 in each of which the right and left cerebral hemispheres were analyzed separately, 5 from which portions of fresh brain and

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ether-extracted portions of the same brain were analyzed, and 12 from which serum, hemispheres and cerebellums were analyzed. The dogs were adult, but of unknown age, and were maintained on an alternate meat and dog-chow diet for 3–4 weeks before blood samples were removed and collected under oil, and before the brain was removed following nembutal anesthesia. The right and left hemispheres from the same animal gave the same analytical results, expressed as units per kgm. of fresh hemisphere: Total H_2O 761·3 gm., total N 18·9 gm.; Cl 36·71, Na 51·0, K 95·6, Ca 1·07, Mg. 5·63 millimoles. The cerebellum with brain stem gave the following mean average results: Total H_2O 745·0 gm., total N 19·1 gm.; Cl 35·19, Na 50·8, K 92·7, Ca 1·07, Mg 5·40 millimoles. Because the analyses of the hemispheres and the cerebellum following extraction of the dried tissue with ether and petroleum ether gave low concentrations of Cl, Na and K, the analytical results were not expressed in terms of fat-free tissue. The data on serum for comparison were: Total H_2O 923·6 gm., Cl 108·8, Na 141·4, K 4·66, Ca 2·47, and Mg 0·95 millimoles. H. L. WILLIAMS (Chem Abstr.).

Physicochemical Changes in the Brain Accompanying Electrically Induced Convulsive Discharge. Spiegel, E. A., Spiegel-Adolf, M., and Henny, G. C. [*Trans. Am. Neurol. Assoc.*, **68**, 174 (1942).]

Marked leakage of ions from surviving frog brain in Ringer solution occurred during faradization and one minute after. This effect was absent or minimal in control tests on brains killed by $CHCl_3$ or by heating. MARION HORN PESKIN (Chem. Abstr.).

Alcohol and Driving. Newman, Henry, Fletcher, Edwin, and Abramson, Mason. [*Quart. J. Studies Alc.*, **3**, 15–30 (1942); *cf. C.A.*, **35**, 200².]

Ingestion of 0·5–2 c.c. EtOH (as whisky diluted to taste with iced plain or carbonated water)/kgm. by 150 men and women had widely different effects, from person to person, upon vision, co-ordination, and practical operation of automobiles. When the blood alcohol was 150 mgm./100 c.c. or more, all subjects showed some impairment of performance, but the impairment was not always evidenced in every test upon a given subject. Hence the finding of 150 mgm. alcohol/100 c.c. blood could be taken as adequate proof of "intoxication" only in states such as Arizona, where "intoxication" is defined as any effect, however slight. Elsewhere, the blood alcoholic concentration must be considered as contributory evidence only.

MARION HORN PESKIN (Chem. Abstr.).

Carotid Sinus Syndrome with Hypoglycemia. Camp, Walter H. [*Med. Bull. Veterans' Admin.*, **20**, 339–40 (1944).]

Hypoglycemia may have some relationship to the cerebral type of carotid sinus syndrome.

RACHEL BROWN (Chem. Abstr.).

The Oxygen Metabolism of Monkey Brain in vivo. Schmidt, Carl F., Pennes, Harry H., and Kety, Seymour S. [*Am. J. Med. Sci.*, **207**, 813–14 (1944).]

In rhesus monkeys lightly anesthetized with nembutal supplemented by pentothal, cerebral blood flow was measured and arterial and cerebral venous blood samples were analyzed for O_2, CO_2, and glucose content. RACHEL BROWN (Chem. Abstr.).

Characteristics of the Normal Electroencephalogram. II. The Effect of Varying Blood-sugar Levels on the Occipital Cortical Potentials in Adults during Quiet Breathing. Brazier, Mary A. B., Finesinger, Jacob E., and Schwab, Robert S. [*J. Clin. Investigation*, **23**, 313–23 (1944); *cf. ibid.*, 303–12.] J. B. BROWN (Chem. Abstr.).

Inhibition of Nervous Transmission in Synapses and End-Plates by Thiamine. Unna, K., and Pick, E. P. [*J. Pharmacol.*, **81**, 294–300 (1944).]

Thiamine, 5–15 mgm./100 c.c., inhibits the action of nicotine on the isolated intestine of rabbits and guinea-pigs. Cocarboxylase has a similar effect. The sensitivity to nicotine is restored by washing. The effect is linked to the thiazole moiety of the thiamine molecule and appears to be analogous to the effect of certain sulfonamides. Thiamine also inhibits the action of nicotine in striated frog muscles. The effect of thiamine on the action of nicotine is not influenced by prostigmine. The processes involved in the inhibition of the nicotine action in synapses and in end plates at the myoneural junction are discussed.

L. E. GILSON (Chem. Abstr.).

Trigonelline and Its Relationship to the Pellagra Vitamin. Kühnau, J. [*Vitamine u. Hormone*, **3**, 74–88 (1942); *Chem. Zentr.*, **1**, 970 (1943).]

Experiments on the influence of trigonelline administration on nicotinic acid excretion have not yielded uniform results. In experiments *in vitro* with kidney tissue, a limited extent of demethylation could be demonstrated. A simple method for determining trigonelline in urine is described. Investigations carried out on man showed that in aneurine deficiency the administion of aneurine results in a rapid elimination of trigonelline (stimulation of methylation processes, displacement of nicotinic acid from its phosphoric acid compound).

G. J. SCHEFF (Chem. Abstr.).

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Vitamin E in Neurology. Couperus, J. [*Z. Vitaminforsch.*, **13**, 193–207 (1943).]
In both normal subjects and neurological patients the tocopherol content of the serum was 0·33–1·12 mgm. per 100 c.c. It attained a maximum six hours after oral administration of 300 mgm. dl-α-tocopherol acetate and returned to normal in 24 hours. Free tocopherol did not appear in the serum after intramuscular injection. Tocopherol was not present in cerebrospinal fluid or urine; creatinuria, muscular dystrophy, and amyotrophic sclerosis were not influenced by its administration. J. S. HEPBURN (Chem. Abstr.).

Cerebral Impairment Due to Nicotinic Acid Amide Deficiency. Kuipers, F. C. [*Nederland Tijdschr. Geneeskunde*, **87**, 929–34 (1943); *Chem. Zentr.*, **2**, 432 (1943).]
Cases of pellagra are described which manifested themselves by neurological disturbances without any signs of dermatitis, diarrhea and dementia. BRUNO VASSEL (Chem. Abstr.).

Relationship between Nicotinic Acid and Thiamine. Valeri, Claudio Malaguzzi. [*Klin. Wochschr.*, **22**, 391–2 (1943); *Chem. Zentr.*, **2**, 432 (1943).]
The daily injection of 100 mgm. nicotinic acid and 5–12·5 mgm. thiamine into human subjects caused a marked decrease in the daily urinary nicotinic acid excretion, at times causing its complete disappearance. The administration of large doses of thiamine to rats decreased the nicotinic acid concentration of their livers. It is suggested that whenever a clinical need for nicotinic acid or thiamine therapy arises both be administered.
BRUNO VASSEL (Chem. Abstr.).

The Effect of Dietary Choline upon the Rate of Turnover of Phosphatide Choline. Boxer, George E., and Stretten, DeWitt, jun. [*J. Biol. Chem.*, **153**, 617–25 (1944).]
When a high-fat diet was supplemented with 50 mgm. of isotopic choline chloride per rat per day, the rate of replacement of phosphatide choline in the liver and carcass by labelled dietary choline (N^{15}), was found to be 3·9 mgm. per rat per day. Upon cessation of the choline supplement the isotopic choline concentration dropped more rapidly in the liver than the carcass. New, non-isotopic choline replaced the isotopic fraction at the rate of 1·3 mgm. per rat per day, while fatty livers developed. Choline deprivation decreased the rate of incorporation of new choline in the phosphatides without altering the quantity of phosphatide choline. It is suggested that fatty liver may be due to a change in rate of the incorporation into body phosphatide of dietary or newly synthesized choline. Methods of analysis and calculation are given and results are tabulated. E. R. NEWTON (Chem. Abstr.).

Vitamin B-deficient Animals and Poliomyelitis. Toomey, John A., Frohring, Wm. O., and Takacs, Wm. S. [*Yale J. Biol. Med.*, **16**, 477–85 (1944); *cf. C.A.*, **38**, 568[8].]
A diet low or high in vitamin B was ineffective in attempts to acclimate white rats to Flexner M V strain of poliomyelitis virus. In white mice inoculated with the Lansing poliomyelitis virus, overfeeding with B_1 vitamin rendered the mice more susceptible in the first transfer generation. No significant difference was observed in the second transfer generation.
G. H. W. LUCAS (Chem. Abstr.).

Effect of Added Thiamine on Learning. Harrell, Ruth F. [*Teachers' Coll., Columbia Univ. Contrib. to Education, No.* 877, 55 pp. (1943).]
The hypothesis that learning is so related to nutrition that an increase in learning tends to follow increase in thiamine intake was tested on human subjects. In an orphanage 74 children ranging in age from 4–20 years were divided into two groups such that the groups were as similar as possible in heredity, sex, early economic environment, age, size and intelligence as measured by intelligence tests. The membership of the groups was chosen by someone not connected with carrying out the experiment, and was unknown, during the experiment, to anyone administering the tests, tabulating the data, or dealing with the children, as well as to the children themselves. One group received 2 mgm. extra thiamine daily, in the form of a tablet; the other received a tablet identical except that it contained no thiamine. The daily content of thiamine in the regular orphanage diet was estimated at 0·9 mgm. The following 18 activities were tested: Addition, subtraction, multiplication, division, problems, mixed fundamentals in arithmetic (Thorndike), mixed fundamentals (Woody-McCalls), sums of ten, underlining 4's, underlining A's, completing designs, number span, code learning, reading, throwing 10 baseballs into a pocket, throwing 10 darts at a target, and strength of grip in right and left hand. These tests were carried out 9 times, once at the beginning of the experiment before the administration of the tablets, and 8 times thereafter in a period of six weeks. The two groups were found to be initially well matched in the performance of these tasks. At the end of the experiment the thiamine group was found to have made superior gains in every one of the 18 tests, the superiority varying from 7–87 per cent. among the various tasks. The average superiority in improvement of the thiamine group over the control group was about 27 per cent. Complete tables of data are given. MARJORIE ANCHEL (Chem. Abstr.).

Spontaneous Beriberi in the Monkey. Leblond, C. P., and Chaulin-Serviniere, J. [*Ann. inst. Pasteur*, **68**, 391–408 (1942); *cf. C.A.*, **36**, 4167[3].]
Twenty cases of a cardio-nervous malady were observed in a colony of *Macaca sylvanus*. The

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clinical signs of polyneuritis, and cardiac failure, the verification at autopsy of degenerated peripheral nerves and the hydropericardium showed a deficiency in vitamin B_1 indicating beriberi to be the disease. Treating the animals with crystallized vitamin B_1 had a slight curative effect, but was not prolonged owing to the expressive degeneration and permanent lesions. It was found that when the vitamin B_1 deficiency was only partial, the same picture of beriberi appeared in the monkey. BENJAMIN PRESCOTT (Chem. Abstr.).

Histological Study of the Central and Peripheral Nervous System in Monkeys Experimentally Deprived of Vitamin E. Wechsler, Israel S., and Globus, Joseph H. [*Trans. Am. Neurol. Assoc.*, **68**, 179–80 (1942).]

Monkeys deprived of vitamin E for 2–18 months showed variable amounts of fat more or less diffusely distributed through the lower part of the brain stem (especially pyramids, medial lemniscus and restiform body), fat changes also throughout the spinal cord, and some fat in the subcortex, motor and sensory roots, and larger peripheral nerve roots. An old monkey on a normal diet showed presence of fat like that in the animals deficient in vitamin E. A young control exhibited no myelin degeneration. MARION HORN PESKIN (Chem. Abstr.).

Symptoms and Neuromuscular Lesions in Vitamine E Deficiency in Adult Rats. Monnier, M. [*Verhandl. Ver. schweiz. Physiol.*, **18**, 35–7 (1944); *cf. C.A.*, **38**, 7091⁷.]

The first symptoms were observed after 10½ months. Degenerative changes were found in skeletal muscles, often near the vessels. There was loss of cross-striation, necrosis, monocytic infiltration of the fibers, endo- and peri-mysial fibrosis, and fatty degeneration. After 14 months and longer there was motor ataxy, paresis of the hind limbs, disturbance of deep sensibility, sensory disturbances (loss of smell and hearing), exophthalmos and urinary incontinence. There was degeneration of the tracts of Goll and Burdach, of anterior and lateral horn cells, demyelination of peripheral nerves, and more pronounced degeneration of the skeletal muscles.

B. C. P. A. (Chem. Abstr.).

Fractionated Examination of the Carbohydrate Metabolism in Some Neurological Cases. Hammarsten, Greta, and Mindus, Erland. [*Acta Med. Scand.*, **113**, 201–16 (1943); *Chem. Zentr.*, **1**, 2106 (1943).]

The blood sugar and pyruvic acid after repeated glucose loading were determined in a case of polyneuritis caused by ileus, a case of acute confusion in myelopathy connected with achylia and liver cirrhosis, and in a case of facial neuralgia with relapsing colitis, in part with and in part without treatment with vitamin B. The pyruvic acid values were increased in all three cases. Treatment with vitamin B lowered the pyruvic acid values, but they did not become entirely normal until after further supplementary treatment with Mg salts. The relation of the avitaminoses B to neurological diseases is discussed. RUTH BERGGREN (Chem. Abstr.).

Biochemical Determination of Eserine by Its Anticholinesterase Action. Its Use in Materia Medica and Pharmacy. Vincent, D., and Maugein, A. [*Bull. sci. pharmacol.*, **49**, 165–7 (1942); *cf. C.A.*, **38**, 3680⁹.]

Leech muscle can be used for galenical preparations and for the natural drug. Other alkaloids having an anticholinesterase effect, although at a lesser degree, can be assayed by this method also. They are geneserine, dihydroxicodienone, codeine, morphine and heroin.

A. E. MEYER (Chem. Abstr.).

Serum Cholinesterase during Excitation of Abdominal Vagus. Huidobro, F., Croxatto, F., Croxatto, R., and Donoso, R. [*Anales acad. biol. Univ. Chile*, **3**, 67–73 (1939).]

In cats under dial, stimulation of the vagus below the origin of its cardiac branches for 2–5 minutes increases by 7–15 per cent. the cholinesterase activity of venous blood from the splanchnic area. In adrenalectomized cats the increase is 26–30 per cent. After atropine (1 mgm. per kgm.) stimulation of the vagus does not change the cholinesterase activity of blood.

B. C. P. A. (Chem. Abstr.).

Serum Cholinesterase and Pathological Conditions. Huidobro, F., and Croxatto, R. [*Anales acad. biol. Univ. Chile*, **3**, 91–103 (1939).]

The cholinesterase activity of serum of patients does not depend on age, sex, diet, exercise, temperature, pulse rate or blood pressure, but mainly on the general condition. In 96 per cent. the serum cholinesterase activity was decreased, and in 80 per cent. it varied with the general state. In 17 per cent. serum cholinesterase in patients was within the normal range.

B. C. P. A. (Chem. Abstr.).

Variations of Serum Cholinesterase During Muscular Contraction. Croxatto, H., Croxatto, R., Huidobro, F., and Salvestrini, H. [*Anales acad. biol. Univ. Chile*, **3**, 106–10 (1939).]

Stimulation of the sacral and lumbar plexuses in cats under dial increases cholinesterase activity of blood from the hind limbs. Direct stimulation of a muscle decreases the cholinesterase activity of the blood from the hind limbs. These phenomena are not due to stimulation of sympathetic fibres. B. C. P. A. (Chem. Abstr.).

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Theory of Cholinesterase Inhibition. Zeller, E. A. [*Verhandl. Ver. Schweiz. Physiol.*, **21**, 43–4 (1942).]

There is a linear relationship between speed of reaction and anti-cholinesterase concentration in a system containing large quantities of acetylcholine, compared with the anticholinesterase concentration. The curve becomes parabolic when the concentration of the latter is increased and follows the equation $y = ax^b$ (y = enzyme inhibition, x = anticholinesterase concentration, a and b = constants). This relationship held for the following anticholinesterases: Sulfanilamide, pyrazolone, morphine, procaine, percaine, eserine. The inhibition with increasing choline concentraton was greater than expected. Human brain and guinea-pig serum cholinesterases were less inhibited by the same concentration of an anticholinesterase than human serum cholinesterase; the constant b is smaller in the first two cases than in the latter.

B. C. P. A. (Chem. Abstr.).

Changes in Serum Cholinesterase during Sympathetic Stimulation. Croxatto, R., and Huidobro, F. [*Anales acad. biol. Univ. Chile*, **3**, 121–4 (1939).]

In normal or adrenalectomized cats there is no change in serum cholinesterasic activity during stimulation of splanchnic nerves. B. C. P. A. (Chem. Abstr.).

Changes in Serum Cholinesterase Following Excitation of Vagus in Neck. Croxatto, H. [*Anales acad. biol. Univ. Chile*, **3**, 125–32 (1939).]

In cats under dial (0·7 c.c. per kgm.) with vagi cut in the inferior thoracic region below the heart and lungs, stimulation of peripheral end of the vagi in the neck lowers serum cholinesterase by 26 per cent. If both vagi are intact and the blood from the coronary sinus is excluded, stimulation of the vagi in the neck increases the cholinesterase activity of the blood flowing from the jugular veins, and decreases that from the coronary sinus. Atropine abolishes and adrenalectomy does not modify the effect of vagal stimulation. The fall of serum cholinesterase is therefore due to the vagal effect on the heart. B. C. P. A. (Chem. Abstr.).

Changes in Cholinesterase Activity of Superior Cervical Ganglion after Section of Preganglionic Fibers. Croxatto, R., Huidobro, F., and Luco, J. V. [*Anales acad. biol. Univ. Chile*, **3**, 7–10 (1940).]

The cholinesterase activity of the superior cervical ganglion of cats is decreased by 40–60 per cent. 24–72 hours after section of the preganglionic fibers. Later the cholinesterase activity remains constant, being 20–40 per cent. below normal. B. C. P. A. (Chem. Abstr.).

Cholinesterase Activity During Nervous Stimulation. Croxatto, R., Huidobro, F., Salvestrini, H., and Luco, J. V. [*Anales acad. biol. Univ. Chile*, **3**, 11–14 (1940).]

After stimulation of the sciatic and vagus of the cat *in vitro* in serum, there is no change in the cholinesterase activity of the serum. After stimulation of the post-ganglionic cholinergic fibers to the iris, the aqueous humor has, as before stimulation, no cholinesterase activity. After stimulation of the preganglionic fibers to the superior cervical ganglion the cholinesterase activity of the latter is unaltered. B. C. P. A. (Chem. Abstr.).

Cholinesterase Activity of Serum During Stimulation of Motor Nerves. Salvestrini, H., Huidobro, F., and Luco, J. V. [*Anales acad. biol. Univ. Chile*, **3**, 15–29 (1940); *cf. C.A.*, **36**, 4530[8].]

In cats under dial, stimulation of the sciatic and crural nerves with currents of 240 cycles per second affects the cholinesterase activity of serum from the inferior vena cava. The serum changes follow variations of tension of the stimulated muscles; enzyme activity is greatly increased at the beginning of stimulation, rapidly falls, rises again, and eventually drops to a low value. Thus in the curve of the cholinesterase activity it is possible to recognize the five phases which have been described as characteristic of tensions recorded from muscles similarly stimulated. No changes of serum cholinesterase activity were observed in non-stimulated animals, or on direct stimulation of denervated muscles, or with curarized muscle.

B. C. P. A. (Chem. Abstr.).

Cholinesterase and Monoamine Oxidase in Human Brain. Birkhauser, H. [*Verhand. Ver. Schweiz. Physiol.*, **17**, 8–9 (1940); *cf. C.A.*, **37**, 2021[7].]

The acetylcholine quotient (c.c. of O taken up by 100 mgm. of tissue in 120 minutes) in adult human brain was for thalamus 2·9 (± 0·1; 23 cases), caudate nucleus 29·1 (± 1·2; 22 cases), putamen 38·1 (± 1·1; 18 cases), globus pallidum 10·0 (± 0·5; 15 cases), cortex 1·6 (± 0·08; 23 cases. The corresponding values for monoamine oxidase were in persons above 60 years 104 ± 8·7 (13), 93 ± 5·6 (13), 78 ± 9·2 (9), 63 ± 6·2 (7), 50 ± 3·1 (13); in subjects under 60 years, 90 ± 5·1 (6), 88 ± 4·3 (7), 73 ± 3·3 (7), 81 ± 5·1 (6), 47 ± 1·9 (7), in small infants for thalamus 38 ± 2·3 (4), caudate nucleus 24 ± 0·4 (4), and cortex 19 ± 2·9 (3). The cholinesterase values in 5 small infants were 4·8 (thalamus) and 16·8 (caudate nucleus).

B. C. P. A. (Chem. Abstr.).

Cholinesterase and Female Sex Hormones. Birkhauser, H. [*Verhandl. Ver. schweiz. Physiol.*, **18**, 15–16 (1941); *cf. C.A.*, **35**, 2574[4].]

A glycerol solution of estradiol dipropionate has no effect on the cholinesterase content of

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rat liver *in vitro*. *In vivo*, estradiol increases the cholinesterase content of liver secondary to an increase in its acetylcholine content. The increase in uterine blood flow following administrations of estradiol is due to an increase in uterine acetylcholine concentration. The liver cholinesterase content of rats suffering from beriberi is diminished.

B. C. P. A. (Chem. Abstr.).

Effect in vitro of Curare Alkaloids and Crude Curare Preparations on True Cholinesterase and Pseudocholinesterase Activity. Harris, Meyer M., and Harris, Ruth S. [*Proc. Soc. Expl. Biol. Med.*, **56**, 223–5 (1944); *cf. C.A.*, **35**, 4491⁷.]

Five pure curare alkaloids and several impure curare preparations were investigated for effect on the activity of the true cholinesterase and pseudocholinesterase of serum. A very active substance which specifically inhibits the pseudocholinesterase was found in some of the preparations. It inhibited true cholinesterase slightly or not at all.

L. E. Gilson (Chem. Abstr.).

Variations in the Cholinesterase Activity of Blood Serum during Violent Muscular Exercise and in States of Hypoglycemic Shock. Huidobro, F., Guzmán, D., and Andia, M. [*Rev. med. y alimentación*, **6**, 38–40 (1943–44).]

Violent muscular exercise increases the cholinesterase activity of human serum by 15·4 = 1·2 per cent. in men and 21·8 = 2·1 per cent. in women. Hypoglycemic shock produces no regular change in the cholinesterase activity. H. L. Williams (Chem. Abstr.).

Traumatic Shock and Serum Cholinesterase. Mediator Role of Acetylcholine in the Pathogenesis of Shock. Frommel, Ed., Thalheimer, M., Herschberg, A. D., and Piquet, J. [*Helv. Physiol. Pharmacol. Acta*, **1**, 451–66 (1943) (*in French*).]

In unanesthetized guinea-pigs, bruising exposed leg muscles, bruising the exposed sciatic nerve, removal of a 2-cm. section of the sciatic nerve, and bruising the leg muscle after cutting the nerve, all caused serum cholinesterase (I) to drop to 40–70 per cent. of its normal level within 45 minutes. Return to normal required 4–16 days. Bruising the leg muscles while under Et_2O anesthesia caused the same drop in (I), but the return to normal required only 48 hours. Excision of the sciatic nerve while under Et_2O caused only a slight drop in (I), and excision after a very large dose of morphine caused no drop in (I). Local anesthesia with procaine causes a large drop in (I) before surgical intervention, and subsequent sciatic excision causes a further decrease. Recovery is slow. The first muscle trauma shock decreases the sensitivity to later repeated trauma. Trauma of muscles after application of a tourniquet produces no decrease in (I) until after the tourniquet is removed and circulation re-established. The drop in (I) is thought to be a secondary result of the shock and not the cause of the shock. The exact mechanism of the shock production is still uncertain. In all the above experiments there was no significant change in the ascorbic acid content of any of the organs of the guinea-pigs.

L. E. Gilson (Chem. Abstr.).

Relation Between the Serum Cholinesterase and the Serum Albumin. Faber, Mogens. [*Acta Med. Scand.*, **114**, 72–91 (1943); *Chem. Zentr.*, **2**, 724–5 (1943).]

Cholinesterase is precipitated from serum by $(NH_4)_2SO_4$ together with the albumin fraction. There is a close relationship between the two, as can be seen from studies on serum from patients with diminishing albumin content. Both substances are apparently produced by the same cells (cholinesterase is formed by the liver) and liberated into the serum. The protein content of the diet, which can produce variations in the serum albumin content, affects also in a similar manner the serum cholinesterase content. S. Morgulis (Chem. Abstr.).

The Cholinesterase of Human Blood. Schaller, Karl. [*Z. klin. Med.*, **141**, 565–89 (1942); *Chem. Zentr.*, **2**, 725 (1943).]

Studies on cholinesterase (I) of human blood according to Ammon's method were carried out in different diseases; and also *in vivo* experiments on the influence on (I) of physostigmine, aneurine, acetylcholine, adrenaline, atropine and forapine. Physostigmine and atropine inhibit, acetylcholine stimulates; aneurine in high concentration inhibits, in low concentration stimulates; adrenaline and forapine have no effect. The relation between serum Na and K and the activity of the blood (I) is discussed. Suggestions are made that determination of (I) can serve for differential diagnosis of icterus; also of the relationship between the reactions of (I) to parenteral administration of these different substances in different diseases. It is pointed out that red cells can serve both as reservoir and place of formation of (I).

S. Morgulis (Chem. Abstr.).

Muscular Activity and Cholinesterase. Croft, Phyllis G., and Richter, D. [*J. Physiol.*, **102**, 155–69 (1943).]

Serum cholinesterase activity is raised during muscular exercise in man, while the cholinesterase activity of blood corpuscles falls; some of the ali-esterase also passes into the serum during exercise. Serum cholinesterase activity is not raised by the administration of adrenaline, ergotamine or histamine, or by overbreathing, underbreathing, or re-breathing the expired air,

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but it is raised during circulatory stasis due to the increase in serum proteins, and this rise is not related to that observed in muscular exercise. The mechanism of the exchange of cholinesterase between corpuscles and serum following exercise is suggested to be the elution of the adsorbed or combined enzymes by some chemical metabolite produced during exercise.

H. L. WILLIAMS (Chem. Abstr.).

Serum Cholinesterase in Diseases. Faber, Mogens. [*Acta Med. Scand.*, **114**, 59–71 (1943); *Chem. Zentr.*, **2**, 724 (1943).]

The variations in serum cholinesterase under normal and pathological conditions were determined in 400 persons. The differences, which are large even in normal people, are still greater in patients. Especially low values were observed in liver diseases, anemia, undernutrition and cancer. The determination of the cholinesterase level by itself is of no diagnostic value, but may contribute to a discovery of some general factor affecting the enzyme content.

S. MORGULIS (Chem. Abstr.).

Effect of Spinal Fluid from Patients with Myasthenia Gravis on the Synthesis of Acetylcholine in vitro. Torda, Clara, and Wolff, Harold G. [*Science*, **100**, 200–1 (1944).]

Human spinal fluid is a more favorable medium to further the synthesis of acetylcholine *in vitro*, with enzyme obtained from frog brain, than is serum. Since less acetylcholine was synthesized in the presence of spinal fluid from patients with myasthenia gravis than spinal fluid of control subjects, it is probable that at least some of the factors responsible for the decrease and increase of the synthesis of acetylcholine pass into the spinal fluid.

E. D. WALTER (Chem. Abstr.).

The Change in the Content of Acetylcholine of the Central Nervous System and Electrotonus. Raspopova, N. A. [*Bull. biol. med. exptl. U.R.S.S.*, **11**, 80–3 (1941); *Chem. Zentr.*, **2**, 921 (1943).]

Polarization with direct current decreases the content of acetylcholine of the central nervous system in the region of the anode, and increases the content in the region of the cathode.

GERTRUDE E. PERLMANN (Chem. Abstr.).

Formation and Functional Role of Acetylcholine in the Nerve Centers. Babskil, E. B., and Kirillova, A. A. [*Bull. Eksptl. Biol. Med.*, **17**, No. 1/2, 37–40 (1944).]

It is shown that in the central nervous system there is formed acetylcholine in amounts sufficient for physiological action. G. M. KOSOLAPOFF (Chem. Abstr.).

In vitro Investigations Concerning a Relationship between the Acetylcholine Content of Heart Muscles and their Innervation. Lissak, K., Toro, I., and Pasztor, J. [*Arch. ges. Physiol.* (*Pflugers*), **245**, 794–801 (1942); *Chem. Zentr.*, **2**, 437 (1943).]

No acetylcholine was found in 48-hour-old chicken embryos prior to transplantation nor after a 2–4-week incubation period after transplantation of the embryos. Acetylcholine occurred, however, in 3–16-day-old chicken embryo hearts. If these hearts were then incubated for a 2–3-week period the acetylcholine content disappeared again, together with the embryonic nervous sytem. Incubation of such a nerve-free, acetylcholine-free heart muscle preparation or incubation of a 48-hour-old chicken embryo with bone marrow caused the development of new nerve strands and a reappearance of acetylcholine. BRUNO VASSEL (Chem. Abstr.).

The Action of Acetylcholine, Choline and Adrenaline on the Central Nervous System, as Evidenced by Changes in Electrical Conductivity. Rolleri, Felicitas. [*Arch. ges. Physiol.* (*Pflugers*), **245**, 745–55 (1942); *Chem. Zentr.*, **2**, 438 (1943).]

The passage of a galvanic current through the spinal cord of the frog (*R. esculenta*) causes the formation of a substance which, when injected into frogs as a cord homogenate, increases the degree of galvanic excitability. It has been claimed that this substance is acetylcholine, choline or adrenaline. Injection of either of these three compounds into the lymph sacs of frogs produced equal effects, similar to those occurring when the cord suspension was injected. Evidence is presented that acetylcholine and choline stimulate by acting directly upon the central nervous system and not indirectly through a liberation of adrenaline. It is concluded that the substance formed by galvanic stimulation is, however, not identical with acetylcholine.

BRUNO VASSEL (Chem. Abstr.).

Chemical Mediator of Nervous Effects. Action of Acetylcholine and Its Enzyme in Controlling Nervous Activity. Mendel, B., and Henderson, V. E. [*Can. Chem. Process. Inds.*, **27**, 608–12 (1943); *cf. C.A.*, **38**, 5565⁴.]

A reyiew of the evidence for the existence of two separate cholinesterases: pseudocholinesterase, which is only active with high concentration of substrate and acts on many noncholine esters, and true cholinesterase, which acts at low substrate concentration and is specific for choline esters. The latter is responsible for the destruction of acetylcholine in the body. Methods for distinguishing the two forms and assaying them are also reviewed.

B. C. P. A. (Chem. Abstr.).

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Effect of Adrenaline on the Synthesis of Acetylcholine. *Torda, Clara, and Wolff, Harold G.* [*Proc. Soc. Exptl. Biol. Med.*, **56**, 86–7 (1944).]

The synthesis of acetylcholine by the action of homogenized frog brain on human serum of spinal fluid containing added physostigmine and glucose is described. Adrenaline in concentrations of $1/10^8$–$1/10^6$ increased the synthesis by 40–150 per cent. above the control.

L. E. GILSON (Chem. Abstr.).

Effect of Vitamin B_1, and Cocarboxylase on Synthesis of Acetylcholine. [*Ibid.*, 88–9.]

In the synthesis of acetylcholine by the action of frog brain on human serum or spinal fluid both thiamine-HCl and thiamine pyrophosphate, in concentrations of $3/10^6$ M and $2/10^6$ M, respectively increased the synthesis by about 10 per cent. Higher concentrations decreased the synthesis. L. E. GILSON (Chem. Abstr.).

Mechanism of the Action of Acetylcholine. *Müsch, H. J.* [*Arch. exptl. Path. Pharmakol.*, **202**, 467–72 (1943).]

Denervated leech muscle was used. In addition to the known usual effects of acetylcholine and cholinesterase, it was observed that if the muscle is first treated with acetylcholine (1 : 10,000 in Ringer solution), then washed, subsequent treatment with cholinesterase (horse serum diluted with 2 volumes of Ringer solution) causes strong rhythmic contractions. The action of carbaminoylcholine chloride is not modified by cholinesterase. L. E. GILSON (Chem. Abstr.).

Effect of Acetylcholine on Peripheral Muscle of Ciona intestinalis. *Cardot, H., and Porel, L.* [*J. Physiol. path. gen.*, **37**, 1617–21 (1939–40); *Chem. Zentr.*, **2**, 1109 (1943).]

Within the time in which a readily excitable peripheral muscle of *Ciona intestinalis* makes short contractions in response to a mechanical stimulus, no observable contraction is caused by acetylcholine unless the muscle has been previously exposed several hours to eserine. Then, if eserine exposure has been long enough, mere traces of acetylcholine cause contraction.

JULIAN F. SMITH (Chem. Abstr.).

New Concepts of the Voluntary and Involuntary Regulatory Mechanisms of Organs. Acetylcholine and the Sympathetic Nervous Control of the Adrenals. *Danielopolu.* [*Ann. d'endocrinol.*, **4**, 1–24, 69–86 (1943); *Chem. Zentr.*, **2**, 1552 (1943).]

The involuntary nervous control of the adrenals is controlled by means of two antagonistic efferent and two antagonistic afferent limbs. There is an additional sympathetic-parasympathetic control. The neurons of the preganglionic fibres of the sympathetic and parasympathetic neurons belong to one class of cells, while the postganglionic sympathetic neurons and the chromaffin cells of the adrenals comprise a second type of nerve cells. Only the latter type is the acetylcholine-requiring system. BRUNO VASSEL (Chem. Abstr.).

2. Pharmacology and Treatment.

Frequency and Duration of the Subjective and Secondary Effects of Benzedrine and Pervitin on Intensely Fatigued Persons. *Alwall, Nils.* [*Acta Med. Scand.*, **114**, 6–32 (1943) (*in German*).]

Some 700 soldiers (20–22 years) were fatigued by three nights of prolonged exertion with little sleep in the intervening days. Some were given dummy tablets, others tablets containing 20 or 30 mgm. of benzedrine or 18 mgm. of pervitin on the last (sometimes also second last) morning of the experiment. Benzedrine and pervitin both reduce or eliminate the subjective fatigued appearance and improve the spirits of the men. Benzedrine (20 mgm.) seems to be more effective after 36 hours of progressive fatigue. Pervitin (18 mgm.) is less effective than 20 mgm. of benzedrine, while 30 mgm. of benzedrine is better than either of the above. The infrequent secondary effects were of short duration. H. L. WILLIAMS (Chem. Abstr.).

The Action of Benzedrine and Pervitin on the Physical and Mental Ability of Intensely Fatigued Men. [*Ibid.*, 33–58.]

Benzedrine and pervitin improved the ability of some 1,400 soldiers, fatigued as above, to march. The subjective effect of 20 mgm. of benzedrine given on the third morning of the experiment seems to last at least 24 hours. Following a 20-mgm. dose of benzedrine the ability to do the Bourdon test and mathematical calculations is improved, but the variations in the results do not permit an optimal dose to be determined. The effect on the fighting ability cannot be stated. H. L. WILLIAMS (Chem. Abstr.).

The Effect of Benzedrine and Pervitin upon the Nervous System. *Koshtoyants, Kh. S., and Mitropolitanskaya, R. L.* [*Doklady Akad. Nauk. S.S.S.R.*, **89**, 216–18 (1943); *Compt. rend. acad. sci. U.R.S.S.*, **89**, 201–2 (1943) (*in English*); *cf. C.A.*, **84**, 1400[1], 4810[3].]

One 5 to 10 mgm. dose of pervitin (1-phenyl-2-methyl-aminopropane) given to hedgehogs and hamsters 1½ months before the end of hibernation caused a wakeful state and unusual motor activity for two to four hours, when the animal again fell asleep. Benzedrine (1-phenyl-2-aminopropane) was shown to have an inhibiting effect upon the enzyme cholinesterase. The

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source of cholinesterase was equine serum in dilutions from 1 : 10 to 1 : 100,000. The serum in 1 : 10,000 dilution mixed with acetylcholine for 20 hours entirely eliminated the ability of the acetylcholine to cause contraction of the dorsal muscle of the leech. When benzedrine was added to the mixture a 1 : 100 dilution of serum was required to inactivate the acetylcholine. The effect was not altered by the concentration of benzedrine.

E. K. SLEATOR (Chem. Abstr.).

Physiological Stimulants (Benzedrine and Pervitin). Koshtoyants, Kh. S. [*Sovet. Med.*, **6**, *No.* 1/2, 8–11 (1942).]

A brief review. G. M. KOSOLAPOFF (Chem. Abstr.).

Comparative Anticonvulsive Action of 3, 5, 5-*trimethyl-oxazolidine-2, 4-dione (Tridione), Dilantin and Phenobarbital. Everett, Guy M., and Richards, Richard K.* [*J. Pharmacol.*, **81**, 402–7 (1944).]

"Tridione" has marked antagonistic action against the production of convulsions in mice by metrazole, strychnine, picrotoxin, thujone, cocaine and procaine and by electric shock in rats. Comparative experiments with phenobarbital and dilantin showed that tridione is more comparable to phenobarbital in its action, but produces less depression in effective doses.

L. E. GILSON (Chem. Abstr.).

Hydantoins in Treatment of Epilepsy. Boller, Werner. [*Schweiz. med. Wochschr.*, **73**, 699–707 (1943); *Chem. Zentr.*, **2**, 541–2 (1943).]

Clinical tests with 67 epileptics were made with 5, 5-diphenylhydantoin (Tacosal, Helvepharm) (I), its Na salt (Antisacer, Dilantin, Dintoina, Diphedan, Diphantoin, Epanutin) (II), its Ca salt (Helvepharm) (III), 5-phenyl-5-ethyl-3-methylhydantoin (IV), and its blend with phenylethylbarbituric acid (Hydantal) (V), 5-phenyl-5-ethyl-1, 3-dimethylhydantoin (VI), 5-cyclohexenyl-5-allylhydantoin (VII), and 5-phenyl-5-ethylthiohydantoin (VIII). Results in number of cases:

Drug.	Long freedom from attack.	Severe attacks halved in number.	Favourable effect.	Inert.	Harmful.
I	4	5	1	2	1
II	5	10	9	5	—
III	2	3	10	7	—
IV	—	—	—	—	—
V	10 (± ?)	11	11	10	—

Two cases with (I) and one each with (II) and (III) were inconclusive. In general, these drugs are all useful as antiepileptics and about equally potent, but their action is unpredictable and sometimes absent. Their freedom from hypnotic action is advantageous. The latent period preceding optimum effect is 2–5 weeks. The risk of side reactions necessitates medical supervision, but can be minimized by giving phenobarbital at the same time. Gastrointestinal side reactions can be avoided by giving the free acids instead of the salts. Severe neurological or psychological reactions or pronounced hypersensitivity may compel smaller doses or cessation of the drug, but treatment can be resumed after a few weeks. Because of high toxicity and lack of potency (VII) and (VIII) proved unsatisfactory. Effects of the specified hydantoins on the blood picture are discussed in detail. JULIAN F. SMITH (Chem. Abstr.).

The Mode of Action of the Na Salt of Diphenylhydantoin (Dilantin) in Epilepsy. Naffziger, Howard C., Aird, Robert R., and Strait, Louis. [*Trans. Am. Neurol. Assoc.*, **68**, 133–5 (1942).]

After intravenous injection of cocaine-HCl in convulsive doses in cats, the amounts of this compound found spectrochemically in the motor cortex were significantly higher in animals given Na diphenylhydantoin (I) than in controls. The authors infer that in experimental (drug) epilepsy, (I) may protect against convulsions, in part at least, by altering permeability of the cortical cells. MARION HORN PESKIN (Chem. Abstr.).

Physiological Studies of the Effects of Sulfonamide Compounds on the Brain of Macaca mulatta. Jasper, Herbert, Cone, Wm. V., Pudenz, Robert, and Bennet, Thomas. [*Trans. Am. Neurol. Assoc.*, **69**, 109–12 (1943).]

Microcrystalline sulfathiazole locally applied to the injured or uninjured monkey cerebral cortex produced local epileptiform spikes in the electroencephalogram and Jacksonian seizures increasing in severity and extent within a few hours; when 100 mgm. was applied at once the animals died in *status epilepticus*, or recovered after 4–6 days of generalized seizures. Upon intravenous administration, Na sulfathiazole produced restlessness at 10 mgm. per cent. free and 13 mgm. per cent. total sulfonamide in the blood, extreme excitement at 40 mgm. per cent. free and 60 mgm. per cent. total, epileptiform spikes at 60 mgm. per cent. free and 85 mgm. per cent. total, and generalized convulsions at an average of 88 mgm. per cent. free and 114 mgm. per cent. total. Microcrystalline sulfapyridine locally applied caused mild excitation of the injured cerebral cortex and did not affect the uninjured cortex. Marked cortical excitation was pro-

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duced by intravenous injection of Na sulfapyridine to produce blood levels of 10–15 mgm. per cent. free and 20–30 mgm. per cent. total sulfonamide. Cortical activity was unaffected by local applications of microcrystalline sulfadiazine to the injured or uninjured cortex, or intravenous injection of Na sulfadiazine to produce blood levels of 107 mgm. per cent. free and 260 mgm. per cent. total sulfonamide. Depression rather than excitation of cortical activity was produced by microcrystalline sulfanilamide applied locally to the injured or uninjured cortex or injected in saline suspension intraperitoneally; fatal coma followed blood levels of 60–70 mgm. per cent. free and over 100 mgm. per cent. total sulfonamide after the intra-peritoneal injection. For clinical topical application to the brain, Jasper *et al.* recommend sulfanilamide and sulfadiazine, in sparing circumspect dosage, and condemn sulfathiazole and sulfapyridine. They have used a mixture of sulfanilamide (for rapid diffuse action) and sulfadiazine (for more prolonged and eventually more potent local antibacterial effect) in potentially and actually infected wounds of the human brain. MARION HORN PESKIN (Chem. Abstr.).

The Chemotherapy of Intracranial Infections. The Clinical and Pathologic Effects of the Intracranial Introduction of Sulfanilamide, Sulfathiazole and Sulfadiazine in Normal Dogs. Pilcher, Cobb, Meacham, W. F., Angelucci, Ralph, and Benz, Edmund. [*Trans. Am. Neurol. Assoc.*, **69**, 93–6 (1943); *cf. C.A.*, **38**, 164[6].]

When placed on the cerebral cortex of normal dogs, in dosage of 10–66 mgm./kgm. through a dural incision which was subsequently closed, sulfathiazole (I) produced violent convulsions, sulfadiazine (II) caused convulsions in one animal only, and sulfanilamide (III) was non-convulsive. All the compounds were absorbed slowly into the cerebrospinal fluid and blood. Necropsy up to several weeks after implantation revealed (II) and (III) as soft pastes, (I) as a hard plaque, at the implantation site. (I) Markedly increased the lymphocyte content of the cerebrospinal fluid, (II) and (III) did not. (I) Crystals appeared in the dura mater of 9 to 26 dogs and in the pia mater of 4 dogs as long as one month after implantation; no (II) or (III) crystals were found in the dura or pia. Inflammatory, obstructive and reparative processes were less marked with (III) than with (I) or (II). When the drugs were placed in a cavity, 1 cm. in diameter resulting from excision of cortical tissue, convulsions occurred in only one dog given (I). No convulsions occurred when (I) was placed on the outer surface of the intact dura; if the dura was incised to a depth of 1 cm., convulsions occurred consistently. Violent, generally fatal, convulsions followed cisternal injection of two, or 20 per cent., suspension of microcryst. (I); (II) administered similarly was convulsive in only one of six experiments. (I) Should never be used in cranial wounds in which the dura is or has been opened, and other sulfonamides, if employed in these infections, should be administered cautiously in smallest effective dosage.
M. H. PESKIN (Chem. Abstr.).

Experimental Pharmacology of Post-encephalitic Parkinson's Disease. Loman, Julius, Myerson, Paul G., and Myerson, Abraham. [*Trans. Am. Neurol. Assoc.*, **67**, 201–3 (1941).]

The most effective combination of drugs for reduction of tremor and rigidity in Parkinson's disease (experiments made chiefly on one patient) was 0·3 mgm. hyoscine plus 20 mgm. amphetamine in a gelatin vehicle, given parenterally. Results with injection of single drugs were as follows: Adrenaline produced marked oscillating tremor of the affected side and increased the rigidity of the arm and leg. Twenty mgm. d-, l- or racemic amphetamine sulfate decreased rigidity and increased the sense of well-being, but did not affect spontaneous or adrenaline produced tremors. Paredrine increased rigidity, did not affect tremor. Propadrine, ephedrine, physostigmine and prostigmine did not affect rigidity. p-Methoxyamphetamine-HCl, ergotamine and neosynephrine decreased rigidity. " 3, 4-Methylenedioxyamphetamine " increased rigidity. Acetylcholine diminished rigidity and counteracted adrenaline effects. Mecholyl and furmethide affected muscle tone in a slightly unfavourable manner. Small doses of doryl favorably influenced affected muscles. Hyoscine diminished rigidity and tremor and prevented adrenaline action but had uncomfortable side effects. Atropine reduced rigidity less markedly than hyoscine and did not influence tremor. Syntropan had little if any effect on rigidity. Metrazole, caffeine and aminophylline affected neither rigidity nor tremor. Amphetamine in gelatine was effective in a patient with spasmodic torticollis. Hyoscine was the only drug benefiting a patient with familial tremor of the head and hands.
MARION HORN PESKIN (Chem. Abstr.).

Reversal of Action of Autonomic Drugs. Asher, L., and Scheinfinkel, N. [*Verhandl. Ver. Schweiz. Physiol.*, **18**, 14–15 (1941).]

Acetylcholine (10^{-7}–10^{-8}) produces relaxation of the dorsal muscle of the leech, if the muscle was previously treated for 10 minutes with cholic acids (0·025–0·05 per cent.), octyl alcohol (0·01–0·1 per cent.), or lecithin, increased rate and force of contractions of atropinized frog heart, and relaxation of frog lung. The substances reverse the action of adrenaline on frog stomach to an increase in motility and that on frog lung to relaxation. B. C. P. A. (Chem. Abstr.).

Nicotinic Acid Treatment of Pellagra in Children. Gershenovich, R. S., Maksudov, A. M., and Ioffe, Ts. G. [*Sovet. Med., No.* **13–14**, 29–32 (1940).]

A general discussion of nicotinic acid (I) therapy is presented with observations on pellagra in children. Biochemical analyses of blood and serum are given for four cases. The authors

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conclude that (I) is an effective remedy for both severe and subclinical pellagra. (I) Is thought to function as an oxidative catalyst in oxidation—reduction systems involved in cellular metabolism. S. GOTTLIEB (Chem. Abstr.).

Action of Acetylcholine, Atropine and Eserine on the Central Nervous System of the Decerebrate Cat. Calma, I., and Wright, Samson. [*J. Physiol.*, **103**, 93–102 (1944).]

Intra-arterially injected acetylcholine (25–100γ) causes a discharge from the central nervous system, resulting in an increase of tone in the innervated quadriceps. A similar increase in tension was also observed in the quadriceps from which the knee-jerk was elicited. Atropine at first abolishes or diminishes the response to acetylcholine for a period of 45–50 minutes; later "spontaneous" changes in tone can occur. Eserine is excitatory to the central nervous system of the atropinized decerebrate cat in a number of cases, although its action is irregular and unpredictable. Attention is drawn to the striking differences in the action of these drugs in different species, in different preparations and under different anesthetics.

H. L. WILLIAMS (Chem. Abstr.).

The Action of Adrenaline on Transmission in the Superior Cervical Ganglion. Bülbring, Edith. [*J. Physiol.*, **103**, 55–67 (1944).]

Adrenaline modifies the transmission of impulses in the perfused superior cervical ganglion; the contractions of the nictitating membrane in response to stimulation of the preganglionic fibres are increased by adding to the perfusion fluid small doses of adrenaline, whereas they are decreased by large doses. The increase is observed only with submaximal stimuli at slow rates. The response to a dose of acetylcholine injected into the ganglion perfusion circuit is augmented by the presence of small quantities of adrenaline and depressed by larger quantities. During prolonged preganglionic stimulation, the venous perfusate collected from the ganglion contains an adrenaline-like substance in concentration sufficient to facilitate synaptic transmission when injected. The source of this material is suggested to be the chromaffin cells (Nebenzellen) found in the superior cervical ganglia. H. L. WILLIAMS (Chem. Abstr.).

Quantitative Studies on Alcohol Tolerance in Man. Influence of Ethyl Alcohol on the Sensory, Motor and Psychological Functions in Relation to the Blood Alcohol in Normal and Habituated Persons. Goldberg, Leonard. [*Acta Physiol. Scand.*, **5**, *Suppl.* 16, 7–128 (1943); *Chem. Zentr.*, **2**, 1381–2 (1943).]

The experiments were carried out on 11 total abstainers, 24 moderate and 14 heavy consumers of alcohol. The methods used are described. There is a linear relation for each individual between the symptoms and the blood-alcoholic content. Symptoms of intoxication appear at a blood-alcoholic level of 0·036 and 0·075 per cent., the results showing the existence of individual differences in the blood-alcoholic level and the toxic effect. The disappearance of symptoms occurs at the same blood-alcoholic levels, whether alcohol is taken alone or with food. By means of appropriate procedure it was established that with the same alcoholic consumption the total abstainers manifest the strongest and the heavy drinkers the weakest effect. These differences, however, cannot be accounted for by differences in alcoholic absorption or in disappearance of alcohol from the blood. The alcoholic habituation is a matter of increased tolerance (decreased degree of intoxication) due to a rise in the blood-alcoholic threshold of symptoms. S. MORGULIS (Chem. Abstr.).

The Effect of Urethan on Neuromuscular Irritability. Borgatti, G. [*Arch. ital. sci. farmacol.*, **12**, 117–28 (1943); *Chem. Zentr.*, **2**, 1383 (1943).]

Urethan in hypnotic doses does not produce any change in the irritability of the isolated sciatic-gastrocnemius preparation of the frog. However, in double this concentration there is first an increase followed by a decrease in reactivity. In *in situ* experiments an effect of urethan is not demonstrable in the frog, whereas in the guinea-pig a decrease of the irritability is observed which is explained by the decrease in body temperature produced by the hypnotic.

R. P. E. HOPF (Chem. Abstr.).

Effect of Picrotoxin on Electrical Excitability of the Respiratory Center. Wells, J. A., Fox, C. A., Rambach, W. A., Dragstedt, C. A., and Windle, W. F. [*Proc. Soc. Exptl. Biol. Med.*, **56**, 176–8 (1944).]

A technique is described whereby electrical stimulation of the respiratory center can be employed to determine directly the influence on the respiratory center of various drugs affecting respiration. Picrotoxin is shown to produce a marked and prolonged (over 7 hours) increase in the sensitivity of the inspiratory center of the cat to direct electrical stimulation.

L. E. GILSON (Chem. Abstr.).

Experimental Nerve Damage by Derivatives of Sulfanilamide. Böszörményi, Zoltán, and Mészáros, Antal. [*Wien. med. Wochschr.*, **93**, 390–1 (1943); *Chem. Zentr.*, **2**, 1823 (1943).]

Intraspinal injections of more or less dilute sulfapyridine and sulfathiazole derivatives caused in the rabbit immediate paralysis and liquefication of the spinal nerve substance, probably by alkaline effect. Intravenous injections did not cause toxic effects. After repeated oral adminis-

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tration obtaining a sulfonamide concentration in the blood of 31 to 48 mgm. per cent. paralysis appeared after 14 days. The anatomical findings corresponded to a peripheral neuritis. Simultaneous administration of vitamin B_1 prevented the paralysis completely or assuaged it considerably. A. E. MEYER (Chem. Abstr.).

Polyneuromyosis after Sulfonamides. Auguste, C., Driessens, J., and Paris, J. [*Presse méd.*, **50**, 659–60 (1942); *Chem. Zentr.*, **2**, 1823 (1943).]

A case of meningococcus meningitis was treated with 6 intraspinal injections of the sulfonamide preparation 1162F and orally and intramuscularly with 693 M. & B., giving a total of 300 gm. Paresis of the lower extremities developed, making walking impossible. Treatment with strychnine and vitamin B_1 was without success. A. E. MEYER (Chem. Abstr.).

Caffeine-withdrawal Headache. Dreisbach, Robert H., and Pfeiffer, Carl. [*J. Lab. Clin. Med.*, **28**, 1212–19 (1943).]

In 55 per cent. of 38 trials on 22 subjects very severe headache was produced by sudden withdrawal of caffeine (2–12 grains daily). The headache is without scotomas, is slow in onset, central in origin, becoming generalized after 4–6 hours; it may be accompanied by nausea and vomiting. In migraine subjects the headache differs from their typical migraine headache. The blood studies indicate that a lowered serum Ca, an elevated serum P, and possibly an increase in blood volume accompany the headache. B. C. P. A. (Chem. Abstr.).

Effect of Sulfanilamides on Cerebral and Neuromuscular Actions. Macht, D. I. [*Exptl. Med. and Surg.*, **1**, 260–72 (1943).]

Rats were subjected to a modification of Watson's maze test, to tight-rope walking, and to climbing a vertical fixed rope, with food at the end of the journeys; sulfanilamide, sulfapyridine, sulfathiazole and sulfadiazine were intraperitoneally injected in doses of 5–200 mgm. Sulfanilamide had no effect on the behaviour of the animals. Sulfapyridine and sulfathiazole in doses of 50 mgm. and more markedly depressed, sulfadiazine (even in massive doses) stimulated, muscular performance. All the rats recovered in a few days, even after large doses of the drugs. B. C. P. A. (Chem. Abstr.).

Neurotoxic Action of Sulfanilamide Derivatives. Puhr, Lajos. [*Schweiz. med. Wochschr.*, **72**, 761–3 (1942); *Chem. Zentr.*, **2**, 1715 (1942).]

Sulfanilamide (I), sulfapyridine (II), sulfanilyldimethylsulfanilamide (III) and sulfamethylthiazole (IV) were administered orally in the form of tablets (0·33 gm. per kgm. body weight per day) to 60 gm. weight, 2-week-old White Leghorn cocks for 70 days. During the course of treatment two animals of each group died (8 test animals) (I), (II) and (III), and one animal of the (IV) treatment group. At the end of the experiment 3 of those given (I) and (II), 2 of those given (III) and 1 given (IV) showed signs of disease. The poisoning manifested itself in contraction of the toes, spastic and ataxic gait, emaciation and unwillingness to move. No pathological changes were found in the sciatic nerves of ill animals. The lateral columns of the spinal cord, on the other hand, and to a lesser degree the anterior and posterior columns showed considerable edema and destruction of the medullary substance. M. M. RATH (Chem. Abstr.).

Passage of Sulfathiazole through the Blood-Spinal Fluid Barrier in Various Forms of Meningitis. Andersen, A. Harrestrup, and Simesen, M. H. [*Acta Med. Scand.*, **114**, 104–26 (1943) (*in English*).]

It was confirmed that the ratio of sulfathiazole in the blood to the sulfathiazole in the cerebrospinal fluid was about 0·20 normally; 9 adults and 11 children averaged 0·17, with a range from 0·12 to 0·22. Ten cases of tuberculous meningitis yielded an average ratio of 0·42 (0·32 to 0·55), while 9 cases of secondary lymphocytic meningitis gave an average ratio of 0·18 (0·14 to 0·23). Cases (9) of primary lymphocytic meningitis were usually characterized by normal ratios. In cases of polyradiculitis and poliomyelitis there is slight, if any, increase in the ratio. If the ratio rises above 0·30 in cases of lymphocytic meningitis it is an indication that the meningitis is of tuberculous nature. H. L. WILLIAMS (Chem. Abstr.).

A Comparative Study of Acetylcholine and Bromocholine Bromides. Oettel, Hansjürgen. [*Arch. exptl. Path. Pharmakol.*, **202**, 314–25 (1943).]

The pharmacological action of bromocholine bromide is like that of acetylcholine bromide, but weaker and more prolonged. L. E. GILSON (Chem. Abstr.).

Action of Pervitin on the Central Nervous System of the Frog, especially the Spinal Cord. Wulff K. [*Arch. exptl. Path. Pharmakol.*, **202**, 449–58 (1943).]

Pervitin injected into the lymph sac has a paralyzing action. The stimulating action which pervitin exerts in man and mammals is lacking in frogs because the centres through which this action is produced are not present in the frog, due to its lower stage of cerebral evolution. In the frog the action is on the spinal cord. The threshold dose is approximately 0·005 mgm./kgm. and the lethal dose is about 1 gm./kgm. L. E. GILSON (Chem. Abstr.).

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Central Stimulating Action of the Alkaloid Cathine. Brücke, Franz Th. v. [*Arch. exptl. Path. Pharmakol.*, **198**, 100–46 (1941); *Chem. Zentr.*, **2**, 637 (1943).]

For centuries a tea made from the branch tips of the shrub *Catha edulis* has been used as a stimulant by the Arabs. The leaves are also chewed. The effects are much like those of benzedrine, and the active principle cathine (katine) appears to be closely related to benzedrine.

L. E. Gilson (Chem. Abstr.).

Central Stimulating Action of Theophylline. Linke, H. [*Arch. exptl. Pharmakol.*, **202**, 481–7. (1943).]

Ingestion of 0·2 gm. theophylline considerably increased mental work ability, as determined by several tests, but had little or no effect on physical work capacity.

L. E. Gilson (Chem. Abstr.).

Effects of Nicotine on Mental and Physical Work Capacity of Man. Erdélyi, Robert. [*Arch. exptl. Path. Pharmakol.*, **202**, 488–92 (1943).]

Nicotine tartrate in oral doses of 6–9 mgm. appreciably increased mental ability and slightly increased manual dexterity. L. E. Gilson (Chem. Abstr.).

Concerning the Parasympathetic Action of Platyphylline. Kovyrev, L. G. [*Byull. Eksptl. Biol. Med.*, **11**, *No.* 1, 92–4 (1941); *Chem. Zentr.*, **2**, 925 (1943).]

Platyphylline is a parasympathetic substance like atropine. It interrupts the response to excitation in the parasympathetic nerve endings, decreases the muscarinic effects of acetylcholine and brings out its nicotinic effect. Other than these platyphylline acts similar to atropine on the vascular centers of the medulla oblongata. The activity of atropine is 20–30 times that of platyphylline. Benjamin Prescott (Chem. Abstr.).

The Action of Some Central Nervous System Depressants upon Water-Salyrgan Diuresis. Lehr, David, Terranova, Rosario, and Boyd, Linn, J. [*Urol. and Cutan. Rev.*, **47**, 661–9 (1943).]

The influence of morphine, aminopyrine, paraldehyde, chloral hydrate and some long- and short-acting barbiturates upon water- and water-salyrgan diuresis of albino rats was investigated. The course of pronounced water diuresis was not markedly enhanced in the presence of salyrgan; in some instances the mercurial diuretic inhibited the flow of urine. Suppression of water diuresis by hypnotics was significant only with dosages which were at least strongly hypnotic, if not anesthetic, and the duration of the antidiuretic effect never exceeded the period of pronounced central nervous system depression. Morphine and aminopyrine caused very strong inhibition of the urine flow without the production of sleep. The mechanism of antidiuresis and the role of peripheral factors in its development are discussed. Salyrgan was ineffective in abolishing oliguria from morphine and barbiturate poisoning, whereas it successfully counteracted the inhibition of water diuresis from paraldehyde, chloral hydrate and aminopyrine. The significance of these findings for human therapy was discussed.

Ruth Berggren (Chem. Abstr.).

Narcotic Action. [*Sereiski, M. Ya.* [*Khirurgiya*, **10**, *No.* 8, 3–13 (1940).]

Effect of narcotics on the brain chemistry was studied on animals. Total N of the gray matter was somewhat increased, and a parallel increase was noted in the white matter after chloroform narcosis. P, non-protein N and amino N also increased. The lipoid fraction increased in both gray and white matter, the unsaturated phosphatides showing the greatest change, in confirmation of the known instability of unsaturated compounds. Cholesterol rise was approximately equal in gray and white matter. In the alcohol fraction increases were also noted, but not reported in view of certain deficiencies of the method of analysis. The increase of both total and non-protein nitrogen is due to accumulation of protein decomposition products resulting from poor circulation due to narcosis. C. S. Shapiro (Chem. Abstr.).

Hypnotic Effect of Rauwolfia serpentina: The Principle Underlying this Action: Its Probable Nature. Chopra, Ram Nath, Gupta, J. C., Bose, B. C., and Chopra, I. C. [*Indian J. Med. Research*, **31**, 71–4 (1943); *cf. C.A.*, **37**, 2819[8].]

In addition to the alkaloids ajmaline, serpentine and serpentinine, which together or singly are medullary stimulants, *Rauwolfia serpentina* also contains a principle with sedative and hypnotic properties. M. H. Power (Chem. Abstr.).

Intoxication by Marihuana. Angulo, Luis Muniz. [*Rev. sanidad militar (Cuba)*, **8**, 115–29 (1944).]

A comprehensive review. Among the subjects covered are description of marihuana, identification of intoxication by marihuana, symptoms of intoxication, differentiation from acute intoxication by alcohol, laboratory, and clinical aids to diagnosis, chronic intoxication, and terminology. The laboratory data obtained either by the Ghamraway reaction (p-dimethylaminobenzaldehyde) or Nicloux (K dichromate) for marihuana detected on the skin or teeth, or in the saliva, urine or blood are discussed. H. L. Williams (Chem. Abstr.).

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Narcotic Excitation and Narcotic Paralysis. Seelich, Franz. [*Ergeb. Physiol., biol. Chem. exptl. Pharmakol.*, **44**, 425–72 (1941); *Chem. Zentr.*, **2**, 2386 (1942); *cf. C.A.*, **35**, 1514[8].]
A critical discussion of old and new narcosis theories.
BENJAMIN PRESCOTT (Chem. Abstr.).

The Effect of Barbiturates on the Cholinesterase in Different Tissues. [*Ibid.*, 269–73.]
The prolonged administration of barbiturates causes a fall in the serum cholinesterase of guinea-pigs, though this is much less pronounced than in man. The fall is evident in the spinal cord and muscle also, but not in the brain. There is no evidence of a "deranged distribution," since the reductions started at approximately the same time in each of the examined tissues, and amounted to about 50 per cent. in spinal cord and muscle extracts, and 40 per cent. in serum. A single deep narcosis by one barbiturate did not alter the cholinesterase activity of the serum, brain, spinal cord or muscle of the guinea-pig. H. L. WILLIAMS (Chem. Abstr.).

An Effect of Barbiturates on Serum Cholinesterase. Schutz, P. [*J. Physiol.*, **102**, 259–68 (1943).]
Serum cholinesterase activity in the morning in fasting individuals was found to give the most characteristic and repeatable values for any particular individual. The activity was much reduced following prolonged administration of phenobarbital or phenylmethylbarbituric acid, while it appeared unaltered after a single large dose of these drugs. Some *in vitro* experiments, as well as the shape of the titration curves, indicate that the decrease is due to a true diminution of the quantity of enzyme present rather than to the action of either the competitive or non-competitive type of inhibitor. The average decrease was about 80 per cent., and is explained on the basis that the cholinergic system under the influence of narcotic produces a relatively lower quantity of acetylcholine, the need for enzyme diminishes, and the quantity of enzyme diminishes. Anaphylactic shock, leptazole convulsions, severe muscular exercise, over-ventilation, lack of sleep, etc., do not alter the cholinesterase content of serum, nor do single large doses of NaBr, caffeine or amphetamine. H. L. WILLIAMS (Chem. Abstr.).

An Evaluation of the Influence of Succinate and Malonate on Barbiturate Hypnosis. Beyer, Karl H., and Latven, Albert R. [*J. Pharmacol.*, **81**, 203–8 (1944).]
Na malonate and Na glutamate, under the conditions described, were without effect on the duration of pentobarbital hypnosis in mice and rats. The observation of other workers, that pentobarbital does not inhibit the oxidation of succinate by the succinoxidase system, was not confirmed. Though the intramuscular injection of Na succinate in mice and rats moderately diminished the duration of pentobarbital hypnosis, the succinate-barbiturate antagonism was not nearly so evident as others have reported. L. E. GILSON (Chem. Abstr.).

A Toxicological and Pharmacological Investigation of Na sec-butylethylbarbituric Acid (Butisol Na). Gruber, Charles M., Ellis, Fred W., and Freedman, Goldie. [*J. Pharmacol.*, **81**, 254–68 (1944).]
The toxicity, duration of action and other effects vary considerably with the species of experimental animal used. The compound is about twice as toxic as phenobarbital. Large intravenous doses produce marked slowing of respiration, or even permanent cessation, with the heart continuing to beat some minutes longer. Moderate doses produce a fall in arterial blood pressure owing to vasodilation, without change in cardiac rhythm. It depresses isolated intestine and uterus. Repeated administration produces no gross changes in the liver or other organs. No significant difference was found in the duration of hypnotic action in normal and nephrectomized dogs; hence it is assumed that the drug is destroyed somewhere in the body, and partly excreted in the urine only when given in excessive doses. L. E. GILSON (Chem. Abstr.).

A Case of Barbital Poisoning Treated with Pervitin. Postma, C. [*Nederland. Tijdschr. Geneeskunde*, **87**, 366–7 (1943); *Chem. Zentr.*, **1**, 2512 (1943).]
Report of a case in which favourable results were obtained by the administration through a stomach-tube of 81 and 90 mgm. pervitin on the first and second days respectively.
RUTH BERGGREN (Chem. Abstr.).

Action of Cardiazole on Experimentally Hyperthyroid Animals. Garcia, Cesar Garayar. [*Rev. med. exptl. (Peru)*, **11**, 367–82 (1943).]
There is an increased frequency and intensity of convulsive reactions in hyperthyroid guinea-pigs and an increased mortality. In dogs treated with thyroid extracts there were more intense convulsions and a decrease of about 30 per cent. in the minimum dose of cardiazole producing convulsions, while the vascular changes were more prolonged but not more intense than in the dogs not receiving thyroid extracts. When guinea-pigs received thyroid extract, desoxycorticosterone and cardiazole the mortality was not increased as when thyroid and cardiazole only were given. It is suggested that thyroid hormone sensitized the nervous system to cardiazole.
H. L. WILLIAMS (Chem. Abstr.).

The Prevention of Traumatic Complications in Convulsive Shock Therapy by $MgSO_4$. Alpers, B. J., and Yaskin, H. E. (*Trans. Am. Neurol. Assoc.*, **67**, 146–7 (1941).]
Patients subjected to metrazole (I) shock were protected from fractures by administration (dose and route not specified) of $MgSO_4$ (II) before (I). (II) Produced transient flaccid paresis

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of skeletal muscles, similar to that caused by curare (III), softened the (I) convulsions, and in some instances abolished the tonic muscular contractions induced by (I). In the discussion A. E. Bennett declared (III) to be preferable to (II) because of more sustained effect and smaller volume of injected solution needed. Bennett also mentioned that the 1 c.c. of prostigmine employed as an antidote, if necessary, for (III), was easier to administer than the large volume of $CaCl_2$ needed intravenously to counteract adverse effects of (I).

MARION HORN PESKIN (Chem. Abstr.).

Electroencephalographic and Clinical Studies following Metrazole and Electrically-induced Convulsive Therapy of Affective Disorders. Levy, Norman A., Serota, Herman M., and Grinker, Roy R. [*Trans. Am. Neurol. Assoc.*, **67**, 10–13 (1941).]

MARION HORN PESKIN (Chem. Abstr.).

Action of Convulsant Poisons on Blood Sugar (11). *Kido, Matunosuke.* [*Kumamoto Igakkai Zassi* (*J. Kumamoto Med. Assoc.*), **16**, 1735–42 (1940); *Japan J. Med. Sci., IV. Pharmacol.*, **14**, *Abstracts*, 39 (1941) (*in German*).]

Gynergen and yohimbine diminish the hyperglucemic action of metrazole, but have no effect on the intensity of the convulsions produced. Atropine has no influence on the hyperglucemic action, but inhibits the production of convulsions. Pre-treatment with chloral hydrate or phenobarbital weakens or inhibits both the hyperglucemic and convulsant action. It appears that metrazole produces hyperglucemia by action through the sympathetic centers independently of its convulsant action.

L. E. GILSON (Chem. Abstr.).

Influence of Chronic Repeated Metrazole Convulsions on Ca Excretion and Urinary Acidity of Rabbits. Laubender, Walther, and Barth, Fritz. [*Arch. exptl. Path. Pharmakol.*, **198**, 5–11 (1941).]

Rabbits were given a convulsive dose (12–18 mgm./kgm.) of metrazole intravenously every 2–3 days for 9 weeks. The excretion of Ca in the urine was not increased during convulsions nor on the intervening days, but remained the same as that of controls. Determinations of urinary pH and titratable acidity indicated a mild acidosis in the metrazole-treated animals.

L. E. GILSON (Chem. Abstr.).

Effect of Repeated Metrazole Convulsions on the Acid-base Balance of the Blood of Rabbits. Laubender, Walther, and Mertz, Bodo. [*Ibid.*, 12–26.]

During each metrazole convulsion an acidosis appeared, which passed away very quickly after the convulsion was over. The CO_2-combining curve of the plasma showed a rounding off like that produced by addition of a strong mineral acid. In addition to this effect, repeated convulsions, as described above, in time produced a lasting acidosis of a different type, characterized by a CO_2-combining curve which was not rounded off, but was more steeply inclined than normal. Apparently two different acids are involved in the effects of acute and chronic experiments. Through *Chem. Zentr.*, **2**, 642 (1943).

L. E. GILSON (Chem. Abstr.).

Action of Metrazole on Crossed Extensor Reflex in Frogs. Sepulveda, J., and Croxatto, H. [*Anales acad. biol. Univ. Chile*, **3**, 55–67 (1940).]

Metrazole increases the crossed extensor reflex in *Bufo gay*, and increases the excitability of the spinal cord in frogs during spinal shock.

B. C. P. A. (Chem. Abstr.).

Action of Metrazole on Neuromuscular Synapses. Salvestrini, H., Crozatto, H., and Alonso, O. [*Anales acad. biol. Univ. Chile*, **3**, 47–54 (1940).]

In cats under dial or chloral + morphine, or decerebrated, metrazole (10–20 mgm.) has a short depressant action on the contraction of muscles stimulated indirectly by tetanizing currents or by condenser discharges, and on muscle twitches produced by intra-arterial injection of acetylcholine. The depressant effect does not occur when denervated muscles are stimulated directly.

B. C. P. A. (Chem. Abstr.).

Action of Metrazole on Superior Cervical Ganglion. Croxatto, H., and Alonso, O. [*Anales acad. biol. Univ. Chile*, **3**, 41–6 (1940).]

In cats under dial (0·75 gm. per kgm., intraperitoneally) metrazole (10–20 mgm.) injected 5–30 seconds before, or during, electrical stimulation of the preganglionic fibers of the superior cervical ganglion, or before intracarotid injection of 20–100γ of acetylcholine, annuls the contraction of the nictitating membrane. Metrazole acts by depressing the ganglion.

B. C. P. A. (Chem. Abstr.).

Action of Metrazole on Cholinesterase Activity of the Spinal Cord of Bufo gay. Sepulveda, J., and Croxatto, H. [*Anales acad. biol. Univ. Chile*, **3**, 31–40 (1940).]

In *B. gay* the cholinesterase activity of the spinal cord between (II) and V vertebrae is higher than in segments above or below metrazole (0·010–0·050 gm.), causes intense generalized convulsions and no change in cord cholinesterase activity. Eserine (0·0005–0·001 gm.) decreases the cholinesterase activity of the spinal cord by 40 per cent.

B. C. P. A. (Chem. Abstr.).

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OBITUARY.

Dr. MICHAEL JAMES NOLAN.

By the death of Dr. Nolan on December 27, 1944, Irish Psychiatry loses almost the last of those great figures who dominated the field of psychological medicine in Ireland for the first thirty years of this century. Leeper, Nolan, Gavin, Mills, Henry Eustace, all have now left us and their places will be very difficult to fill. Of this band Nolan must have been the senior, as he entered the field of psychiatry as far back as 1888, on being appointed Assistant Medical Officer to the Richmond Asylum (now Grangegorman Mental Hospital). In 1893 he was appointed Resident Medical Superintendent of Down County Mental Hospital, Downpatrick, and here he was to labour and to establish his reputation over the next 40 years, only retiring on account of failing eyesight, the result of an accident, in 1935.

Dr. Nolan's work at Down Mental Hospital became known far and wide. He laboured incessantly to bring his hospital to the very first rank of similar institutions, and his work was rewarded by almost all the honours it was possible for him to obtain. In 1924 he was elected President of the Royal Medico-Psychological Association, and in 1926 President of the Ulster Medical Society. In 1931 the R.M.P.A. elected him as Honorary Member.

A walk around Down Mental Hospital with Dr. Nolan revealed his intense interest and pride in his institution, as well as his amazing grasp of the clinical problems of his patients. His standard of perfection was, I believe, extremely difficult to live up to, but even those who felt the task heavy recognized his singleness of purpose, and when promotion in another hospital became possible no one could give greater help; he took, in fact, a great pride in the achievements of former members of his staff.

Even in his retirement he was not inactive, and the writer recalls an important medico-legal case in which he was associated with Dr. Nolan, fortunately on the same side, only some six years ago. For a man in his 79th year to stand up to a gruelling cross-examination by one of the most merciless advocates at the Bar was no mean feat. Only some two or three years ago he revealed in correspondence his continued interest in psychiatry and all modern advances, including shock therapy.

In the Royal Medico-Psychological Association Dr. Nolan took a lifelong interest, and few important meetings anywhere in the British Isles were without the benefit of his clear and precise thinking. He never overcame a slight impediment in speech, but this only seemed to enhance rather than detract from the force of his arguments, which gained additional momentum from his dominating presence and striking physique.

The writer has cause to remember him for many acts of kindness and encouragement. The older members of our Association will easily recall his genial presence, and his obvious pleasure in assisting in all the affairs of the R.M.P.A. But I believe his most lasting memorial, and the one which he himself would treasure most, will be in the memory of many hundreds of patients whom he assisted back to the road of sanity and peace.

The sympathy of all who knew him will be extended to his widow and to his son, Dr. Greene Nolan.

R. Thompson.

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Part I.—Original Articles.

PSYCHIATRIC DEVELOPMENTS.

THE PRESIDENTIAL ADDRESS DELIVERED AT THE ONE HUNDRED AND THIRD ANNUAL MEETING OF THE ASSOCIATION ON WEDNESDAY, NOVEMBER 29, 1944.

By Lt.-Col. A. A. W. PETRIE, *C.B.E.*, M.D., F.R.C.P.,
Medical Superintendent, Banstead Hospital; Physician for Psychological Medicine, Charing Cross Hospital.

THE Centenary Meeting of the Royal Medico-Psychological Association should have taken place in 1940. I was honoured in 1939 by the Association nominating me as President-Elect. Much has happened since then, and for five years we have met under the able presidency of Dr. T. C. Graves, whose inaugural meeting had necessarily to be a short one; it was held in London and was limited to the delivery of his presidential address. I feel that we owe a great debt to Dr. Graves for his constant attendance and work, often under difficult war conditions.

The Association was started in 1841 by a letter addressed by Dr. Samuel Hitch to all medical men attached to the Public Lunatic Asylums of Great Britain and Ireland. It was pointed out that these institutions were the true School of Mental Pathology, and that periodic meetings for the exchange of experience and opinions would be of importance and value. *Six members* attended the original meeting at Gloucester.

The Association was definitely established on July 27, 1841, under the name of The Association of Medical Officers of Hospitals for the Insane, and the original members numbered thirty to forty. The list of original members contains the names of Connolly of Hanwell, Pritchard of Bristol, and Dr., later Sir Charles Hastings (of Worcester), a principal founder of the British Medical Association.

In 1865 the title of the Association was changed to The Medico-Psychological Association of Great Britain and Ireland, and in March, 1926, a Royal Charter was granted.

There is good reason to believe that this Association takes precedence in point of time of any in the world devoted to Medical Psychology and Psychiatry. Its functions were closely followed by an association in France, and then by associations in the U.S.A. in 1844 and in Germany in 1864.

In those early days the Association and its members did excellent pioneer work. The name of Dr. Connolly of Hanwell is still honoured on the Continent and in America as the man who removed the fetters from his patients, and these strange relics of a past age are still preserved at that hospital.

The *Journal of Mental Science* was founded in 1853, being originally called *The Asylum Journal*. It is a pioneer journal, certainly the oldest in the English language to deal with this subject. A recent proposal to change its title provoked much discussion. Perhaps we may be permitted to adopt the dictum of the Prime Minister that "those who can look furthest back can look furthest forward," and so leave our Journal under its old name, to acquire a position of prominence in our rapidly extending specialty as the principal journal of British psychiatry.

All great wars stimulate and stir national thought and modify national life, and the word "reconstruction" is heard on every side. The medical implications of the Beveridge Report and the reactions of the profession to the White Paper on

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National Health Services are all too well known, and psychiatry itself, suffering from growing-pains, will have to adapt to the suggested alterations in general medicine.

The Royal Medico-Psychological Association is now co-operating with the Psychological Medicine Group of the British Medical Association and the Psychological Medicine Committee appointed by the Royal College of Physicians, in an endeavour to produce a single authoritative report on the position and aspirations of British psychiatry, and there seems every hope of this being issued at an early date. Although details of the already published reports of the Royal Medico-Psychological Association and the British Medical Association vary somewhat, there is much unanimity. The details are best read in the official reports. It is only necessary to consider the general trends which are emerging.

Two great principles stand out, firstly, the necessity for all engaged in the specialty to have some knowledge of all the different branches of our work; and, secondly, that a much greater co-operation with general medicine is essential.

Psychiatry, which started with the study of those exhibiting the grosser disorders, has gradually extended to include the neuroses, child psychiatry and delinquency, and by reaching out to adjust those in industry, is tending to become coterminous with psychology, which latter has been broadly defined as the study of behaviour, and includes most human relationships. Those engaged in the treatment of the neuroses are now coming to recognize how essential it is for them to have a competent knowledge of the psychoses, and those who, working in mental hospitals, deal primarily with the psychoses are, through the development of out-patient clinics, acquiring a knowledge of the neuroses. Also the worker in child psychiatry has need of both kinds of knowledge, as well as of mental deficiency, together with a full realization of educational problems. As a well-known worker in this field has aptly observed: "This paragon has still to be created."

This expansion must have a profound effect on our Association if it is to remain a principal force in psychiatry. Sections—officially still designated "sub-committees"— dealing with the neuroses and with child psychiatry have recently been formed, and a section dealing with industrial psychology may logically follow. This is in addition to the Mental Deficiency Section which has been in being for some years. It is evident that a reconstruction of the Society, the recognition of the Sections, and their representation on the Council will be necessary if the Association is to continue to function adequately.

The need for psychiatry has received a fillip from the work with the Armed Forces. Even articles in the lay press show a realization of the constant need felt for psychiatric advice, and if the habit thus acquired is fostered, early advice will be sought with useful results. This helpful work will be less limited under peace-time conditions. In war time the primary consideration must be the individual's fitness for full or partial service, and much trouble has been saved by removing those who by reason of instability or other mental disorder were psychiatrically inefficient, and a trouble and a menace to their comrades and the efficiency of their units. Beyond this, co-operation between the psychiatrist and the National Service officers of the Ministry of Labour has been of help in ensuring their best employment in civilian life.

In peace time the examination and adjustment or rehabilitation of all those who through mental abnormality are rejected by the industrial machine will be most important. However successfully fulfilled is the promise of full employment, there will always be a "hard core" of unemployment, consisting chiefly of persons who are psychiatrically incompetent, even though they may not exhibit obvious mental disturbance. The mentally defective and unstable, as well as the vague group of psychopathic personalities, will largely figure in this group, and psychiatric advice will help to adjust those to whom adjustment is possible, but it will have to be frankly recognized that a proportion will always be dependent on the community. The community would save itself a lot of trouble by deciding at an earlier stage when permanent or semi-permanent segregation is desirable in the interest of the individual and the population in general.

The essential contribution of the psychiatrist must be based on knowledge of normal human behaviour, enlarged and supplemented by a study of the exaggerated reactions of the abnormal. This knowledge can be useful when applied to psychological problems in general, apart from the actual treatment of those who

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need medical help. Its most practical application, beyond treatment, will be in the problems of social medicine, and embraces heredity as well as environment. These factors enter largely into both child and adult psychiatry, and come also into delinquency studies. When industrial and rehabilitation problems are added, we have probably reached the limits of what is feasible and reasonably within our scope.

Nevertheless, beyond this there are many spheres which we may influence, and which in turn may affect us as psychiatrists, and, indeed, may be essential to our own education and efficiency.

We have to face the fact that there are many persons who, apart from the professed psychologists, profoundly affect the psychological aspects of national life. The amount of such material is bewildering, and makes judgment and careful selection necessary. All the arts express psychological aspirations, some paintings seeking expression mainly by symbolism, which appeal according as they strike sympathetic chords in their audience. The emotional releases associated with music are in general universally recognized. This is seen in church music and singing, and accounts for the popularity of concerts and community singing. The novelist cannot be efficient without a knowledge of psychology, if he is to have a proper appreciation of the characters that he is portraying. The brilliantly clever expositions of more elaborate psychological processes are often less popular than simple emotions vividly expressed. Even a cursory knowledge of literature shows that although psychological principles have been restated and relabelled, the underlying principles were understood in classical as well as in more modern times. The most popular authors merely restate ancient themes in modern language. At times a genius arises, such as Shakespeare, whose phraseology appeals as much to-day as in his own time, and psychological principles can be found on every page of his works. This brings us to the playwright and the films, where psychology is even more obvious. The actor to be successful must share this knowledge in order successfully to interpret and expound the characters, and this is not possible without an appreciation of the underlying instincts and emotions.

Certain successful psychiatrists in the past have been men of great versatility, and it is probable that the reason for their success was their wide psychological appreciation. However great their theoretical knowledge, it is doubtful if anyone can be successful as a psychiatrist without this general realization of common emotions.

Other fields of activity from which the psychiatrist can learn are those of advertisement and salesmanship, where the appeal is to the gratification of human instincts and aspirations. Sex and money-making are the basis of many of these appeals, as well as the desire to improve the mind or body. Fear is also utilized, often most unscrupulously, harmlessly when deodorants are being advertised, but causing harm when placebos are sold for serious ailments.

The wide sphere included under propaganda, and much of the work covered by the Ministry of Information, closely concerns the psychologist and psychiatrist. The value of using the father image applied through a well-known entertainer, in conveying needed stimulus to the troops, illustrates how well this is appreciated by those in control.

Interesting and valuable inquiries among cross sections of the population have been going on to obtain knowledge as to the reactions of the people on a variety of subjects. These studies reveal the necessity for instruction, both general and psychological. Such instruction can be beneficial, but it becomes dangerous when used, as with our enemies, to expound a certain school of thought. The fears and suspicions likely to be aroused will always limit such work among a democracy.

Even wider vistas are opened up beyond this. A psychological bureau attached to each of the great political parties is an obvious suggestion, and such parties would be more likely to guide their followers wisely if influenced by sound psychological principles. With a given party in power such bureaux would become advisers to the Cabinet, a position occupied by the soothsayers of the ancient world. These undoubtedly owed their position and success not merely to superstition, but because those who claimed to read the omens were sound practical psychologists and performed a useful function—a lesson for their would-be modern counterparts.

In the field of international politics the study and application of basal psychological principles might save much misery to mankind. A study of the psychology

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of the leading statesmen of the world is of special and material interest. Such an examination was made by a number of leading psychologists and psychiatrists of the man who has been primarily responsible for the disturbance of the peace of the world. It is conceivable that if his sense of frustration had been alleviated earlier by psychological means, history might have been altered, although another and probably similar type of dictator might have arisen. Like many outstanding leaders, particularly of a popular type, he however merely mirrored the views of a number of his followers, who in this case also suffered from feelings of frustration. It is interesting to note that caution and a realization that retribution might follow their exposition on the psychology of the Fuehrer prevented this most interesting document being being published. Less caution was, however, displayed in some similar attempts on this side of the Channel.

Such are some of the possibilities, immediate and remote. How can they be put into effect? Much will obviously have to be done by indirect means, by educating the public, by educating our own profession, and by influencing general psychological thought. Education commences in childhood, and the instruction of the teachers and their active co-operation is a first step.

Essentially, our problem starts before birth, and embraces all environmental factors, particularly in the early and educational years, and this touches most of the social problems, which indirectly concern all medical work.

Heredity.

The intricate subject of heredity has two aspects—the positive one of producing efficient citizens, and the negative one of preventing the unnecessary spread of bad and unstable stocks.

There is no doubt that preventive work in our specialty should start with prenatal influences. Any attempt to interfere with the natural production is quite impracticable in a democracy, but unless such a Government deals with the problem of its less efficient citizens, and prevents them from supplying the bulk of the population, democracy will ultimately decline and decay. Under modern conditions we provide protection for our less efficient citizens who, under jungle conditions, would not be able to survive. By doing this we load the burden on the more efficient members of society, and there is a limit to such a burden. This is bound up with the larger problem of population. The fate of small nations has been all too obvious in this war. Our ultimate survival rests on an ability to produce a reasonable number of citizens equally efficient in peace and war. With modern weapons and quicker movement, the physical and mental standards demanded grow higher, and those liable to crack under strain, mental or physical, are useless in modern armies. The conviction that those inclined under stress to attacks of psychoses and neuroses are a liability to the active fighting elements of the armed forces has grown with experience. The spread of neurotic symptoms among those who are merely weary or unwilling needs attention, and much discrimination is necessary, especially when previous good service has been given. Those who are content to malinger in order to evade service will not make effective soldiers, but should not be allowed to profit by their asocial conduct.

The problem of increasing the numbers of the efficient citizens still remains, and is likely to be insoluble under democratic rule. To be logical, artificial insemination would be as effective in raising human standards as in raising the standards of stock, but such methods will not be adopted by free communities. Nor are we certain regarding the ideals to be aimed at, as we are in the lower animals. An alliance between those descended from an F.R.S. and a stable warrior of distinction, such as the holder of a Victoria Cross, would not necessarily result in producing the best characteristics of each strain, or even an intellectual brave man, although the chances would be greater than with ordinary stock. The geniuses and near geniuses that have been produced by unstable and unhealthy stock show what might be lost to the world by interference. A patient once remarked to me that his immediate family consisted of seven mentally unstable persons and two geniuses. The latter were persons distinguished in a certain branch of the creative arts.

The evil family trees which have been demonstrated as resulting when two bad strains unite need no emphasis, and sterilization or segregation is an inevitable and logical precaution which most psychiatrists will not challenge.

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Aldous Huxley's well-known satire envisages a world based on the production of children *in vitro* instead of *in utero*, and their conditioning for development into supermen, average citizens, and hewers of wood respectively, so forming the perfectly composed state. While these ideas point out the ridiculous side of planning, it is, nevertheless, increasingly dangerous for nations who wish to remain great to ignore all precautions to maintain a healthy and effective race, and in a competitive world governmental action will be necessary in this, as in other spheres. The illusory ideal of fewer and better citizens may merely result in an increasingly elderly nation becoming too decadent to hold its heritage. This obviously means larger and healthier families, preferably among the more intelligent types. History shows that highly civilized species tend to become less fertile, compared with the cruder types. At present even the more obvious methods of increasing the efficient are needed. Taxation takes little account of families, but family allowances, even if rather inadequate, are now likely somewhat to redress the balance.

One important reform seems likely to come into operation, namely, the withdrawal of the bar of marriage on all government-employed women. The virtual sterilization of a multitude of useful government and local government officers was an unmitigated evil. The orientation to spinsterism of a large number of female teachers brought definite harm, and tended towards a political outlook which also had a distorted view towards the family life of the community. The loss of the flower of two male generations cannot be ignored, and has seriously affected the efficiency and virility of the nation.

Child Psychiatry.

A most obvious link in preventive psychiatry is the study of the child. This covers a number of important fields, at present imperfectly linked up. Owing to the importance of its legal aspect, Mental Deficiency has acquired a special significance. The problem covers the unstable and maladjusted child, associated with varying degrees of intelligence or deficiency.

The three modes of approach to child psychiatry are in great need of co-ordination. At present the child guidance clinic may be quite divorced from the work of the school medical officer, and again separated from the work of those who give institutional care to the ascertained defective. It is complicated by the fact that diagnosis rests with the educational authorities, generally advised by the educational psychologist, whereas treatment remains with the health authorities.

One group of medical examining authorities should suffice for ascertaining maladjustment or instability, as well as mental defect, and the same source should organize the treatment.

As a theoretical concept, every child should be examined from a psychiatric point of view when starting its education, during education, and when being adjusted into gainful work, and this last shading off into vocational guidance. Official education is about to cover the period from 5 to 16 years of age, with a possible extension down to 2 and up to 18 years of age, or even higher if university education is included. Even if the official ages only are taken into account, three examinations are all too few, namely, one at the commencement, a second, say, at 11 years, when the type of secondary education is decided, and at 14 or 16 years, when vocation or vocational training looms large. A limited research on a number of varied types of children should point the way as to the benefits likely to be derived from such investigations, and also the type and scope of examinations which should be used.

The practical difficulty at once emerges that the supply of psychiatrists is limited, and that competent child psychiatrists are still fewer in number. Much of this work can and should be done by the educational psychologist, but these are also in very short supply. It has been computed that an educational psychologist is desirable for every 10,000 children, which would mean that large authorities who at present hesitate at employing even one such psychologist ought really to be employing about 45.

There is no branch of psychiatry in which the social worker is of greater importance, and the supply of these is likely to be grossly deficient, even for the evident needs of adult psychiatry, for some time after the war.

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We are thus faced with two problems if this essential work is to develop, to prove to the authorities that they cannot afford to do without this work, and to provide for the training of suitable workers or the education of those handling this work. A primary need is for more psychological instruction for the teachers, who, in the main, are only able to assess intellectual capacity, and are inclined to ignore emotional factors, and this holds to some extent for the educational psychologist, and is not unknown with those who assess mental deficiency. The development of knowledge among the teachers and among educational psychologists will increase the realization of the possibilities, and increase the demand for care and treatment.

There is no branch of psychiatry which so forcibly brings forward the two great factors in this specialty, namely, heredity and environment. The foolish and unstable parent has supplied part of the material, and has probably aggravated inborn tendencies by providing an unsuitable environment. Then social and economic factors inevitably arise, and the problem becomes an endeavour to adjust parents and alter environment generally. Indeed, this leads to a criticism of the child guidance aspects of psychiatry, that it tends to recommend segregation from the unsuitable home—a procedure that is not easy in practice. This is really a wider problems of which separation from the home environment is the easiest way out. The real solution is to render the environment more suitable for the child. The social workers' reports on the maladjusted child should do much to educate the teachers as to the difficulties of their charges, and should help in determining in doubtful cases the type of education for which the child is most suitable. This leads on to the highly debatable question of vocational guidance. The work of selection in the armed forces has been useful in allotting personnel suitably by dividing the material, as regards intelligence and combative capacity, and eliminating as far as possible the neurotic and emotionally unstable. In the civil field the problem is less easy, but it is evident that there is a wide sphere of usefulness in indicating the type of work which can most profitably be followed. Those with a sense of form or mechanical capacity are examples of where this type of help can be suitably given. Any attempt dogmatically to coerce people into occupations considered suitable would be resented and arouse antagonism. With equal opportunity the more favoured occupations will become competitive, and this is envisaged in medicine. The importance of factors other than mere examinational capacity will, it is hoped, be kept in mind. Character, such as power of observation and judgment, and originality in thought, remain as vital as the capacity to absorb and reproduce facts communicated by others. A profession will stand or fall by the intelligence displayed in selecting its recruits.

An important issue is the relation of the psychiatrist to the educational psychologist. Collaboration is essential if suitable guidance is to be given. A complication is the relation of the educational services and the health services. The Education Act places the responsibility for diagnosis of these cases on the educational authority, while the treatment falls under the domain of the Ministry of Health. The education authority commonly employs psychologists, and tends to place them in charge of such guidance centres as they establish. In some cases there is a suspicion that treatment is attempted at these centres, and that cases are only referred to psychiatrists when exhibiting gross and obvious abnormality. The extent to which psychiatrists can allow themselves to be used in a subordinate capacity arises; it is evident that in the absence of medical advice psychological treatment may be directed where physical treatment is really needed. The type and siting of these clinics has been much debated. The educationist favours a clinic at or near the school, and there is something to be said for this in testing and making minor adjustments. The medical predilection is naturally for a clinic at a hospital, and clinics have been successfully organized at psychiatric hospitals. Some would favour the pediatric hospital, but the best site is probably at the general hospital, in association both with the pediatric and psychiatric clinics.

Delinquency.

Delinquency brings a number of children into the psychological net, and much help can be given in respect to family adjustment, and even in regard to unsuitable environment. It must be remembered that a great deal of minor delinquency is

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almost inevitable with children who are likely to become satisfactory and even successful citizens. A child so lacking in initiative as never to break the slowly learnt rules of the community is unlikely to have sufficient enterprise to launch and guide his life successfully. Having eliminated asocial conduct due to faulty upbringing or environment, and making allowance for normal childish exuberance, there remains the child who is definitely unstable, and whose conduct remains unaffected by all efforts at adjustment. There will often be a bad background to such cases, and parents will not usually bring these children for adjustment and treatment unless compelled. A number of such asocial children are the offspring of similar adults, but at times they come from respectable stock. As they grow up they join the problem group of psychopathic personalities, with asocial trends. They are essentially unstable, and few fail to show this in the emotional sphere. The electro-encephalogram has demonstrated the high proportion who show cerebral dysrhythmia, and this accords with clinical evidence. The recognition of this instability by objective findings has been supplemented by a study of the factors which may bring out such latent instability, and this has raised the whole question of criminal responsibility. The McNaghten Rules have remained in force for a hundred years, mainly because no one has yet suggested any satisfactory improvements.

In a recent case it was found that alterations of the blood and cerebrospinal fluid sugar greatly affected the accused's emotional stability, and the jury, against the direction of the judge, found the prisoner not guilty, though legally the judge's view was, of course, correct. In another case the ingestion of much fluid had upset stability in one predisposed, and here the jury did not accept the extenuating facts. The danger that psychiatric reports may be misread or misapplied is recognized in the armed forces, and the legal branch of the army endeavours to assess such reports, and give directions as to proceeding with charges before allowing them to be presented to a court untrained in utilizing such guidance.

The same danger arises with a bench of magistrates, but it is lessened when a stipendiary magistrate or judge deals with the matter. What is disturbing is that if given approximately the same set of facts, different action may be taken. The legal position is quite clear. These people are responsible for their actions, and should be found guilty, but what in effect is happening is that extenuating circumstances are taken into account in migitating any punishment by the reviewing authority, so mingling leniency to the individual with protection to society. The increase of objective evidence of instability will, however, render juries liable to accept such evidence even against authoritative legal opinion. The danger of accepting a state of partial responsibility in unstable psychopaths is more than evident, especially as this is a group especially liable to impulsive crime. Once such people recognize that there is a chance of mitigation of their crimes they will exhibit even less responsibility than at present, and may even, like the ex-psychotic patient, utilize abnormality as a sound line of defence. Alternatively, the recognition that abnormality with asocial conduct together with objective evidence of instability is present may result in the earlier segregation of those who are a social menace. The case for any extension of the law would have to be very definitely indicated, as segregation of even such known cerebral dysrhythmia as epilepsy is not allowed without clear evidence of abnormal conduct.

According to peace-time statistics, 80 per cent. of these recidivists are normal unless the word abnormality is to be stretched and extended. Certifiable abnormality is probably much less. Nevertheless this group remains a social problem, which needs attention. Relief from want and unemployment will not solve the problem in a number of cases, as it is their own restless instability which is the essential factor. A psychopath of Italian extraction admitted that he could earn £10 to £12 a week as an asphalter, and that his average profits from a life of crime did not average £5 a week, but he said he could not stand a quiet life and a steady job. The prospect of dangerous adventure in the army may attract a few, but even these are unable to conform to the necessary discipline, and most of them detest any form of constraint and some abnormally dislike danger. Our ancestors solved the problem by transportation, fortunately diluting the psychopaths sufficiently so that useful communities arose. Can we solve the problem better? A committee of the Home Office has been set up to study the problem, at present not assisted by psychiatric advice.

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Industrial Psychology.

The help which psychology and psychological medicine has been able to give to industry has been recognized for a considerable time, and the reports of the Institute of Industrial Psychology indicate the scope and utility of the work done. Help has been given as to the best methods of work, the natural suitability of the individual worker and the hours which result in the maximum of productive work. In addition to these services, the breaking of monotony, the provision of suitable entertainments and the social relaxation, including welfare services, all touch on the psychological aspect.

There appears to be great variation among industrial medical officers in their appreciation of the psychological aspects of their work, and certainly under the stress of compulsion in wartime this is no negligible factor. The type of patients range from hysterical malingerers to evident neurotics. A number of the slighter cases could be alleviated with a softening of the difficulties and suitable adjustment. Ignoring such persons in the earlier stages increases the number needing serious attention, and increases the chances of strikes. Given full employment there should be great necessity for dealing with similar cases.

Instruction to bring psychiatric knowledge to bear on these subjects seems strongly indicated, and brief courses should fulfil a need, both immediately, and even after improved instruction for the medical student has made its effects felt.

It is not always fully appreciated that a large amount of minor and indefinite sickness is really or mainly psychiatric in nature, and if this were understood it would help greatly in maintaining staffs at a good level of efficiency.

A field which more closely concerns the expert is the worker who has broken down wholly or partly from neurosis. This becomes important when associated with disablement from accidents for which the employer is liable for compensation. We are promised that the whole subject of compensation will be placed on a proper footing, whereby there will be an inducement to become fit for work, whereas the present system has often resulted in semi-invalidism, with disastrous results on the worker's morale and future efficiency. A similar state of affairs resulted from the pension system when applied to neurosis after the last war, when the penalty for recovering from, say, an hysterical paraplegia was a loss of £2 a week pension.

This leads to the problem of properly organized rehabilitation centres for such cases, guided by proper psychiatric experience. There is now every reason to suppose that properly equipped rehabilitation centres will be set up for physical cases, in connection with the Social Service Schemes. Such centres will inevitably need psychiatric advice, even if it should be decided not to deal with psychiatric cases in such units. It should certainly be possible to deal with neurotic disabilities in the same unit as deals with the purely physical problem; indeed it will be difficult to separate them, as these cases mostly tend to have a mental aspect. There is a case for having a unit for unstable neurotics who are unable to face up to ordinary rehabilitation without some preliminary preparation. There is also probably a case for having a separate unit for the recovering psychotic, particularly if rehabilitation is attempted in long-standing cases.

Much of this latter work can and should be done in the mental hospital, but there is a good deal to be said for having smaller units where intensive rehabilitation and the re-acquiring of a habit of work can be established. So many psychotics who have become institutionalized lose their sense of reponsibility and initiative and become incapable of sustained effort, and the re-establishment of these qualities tends to be slow. The same problem arises in long-standing neurotics, who require to be gradually aroused and stimulated into undertaking more and more work and responsibility, and into regaining their self-respect and personality. The rehabilitation experiment of the Ex-Services Welfare Society has succeeded in providing sheltered employment where men can be paid an economic rate of pay which gives them a sense that they were again becoming useful members of society—an essential attribute in dealing with this work.

The boarding-out system can do much to assist in the rehabilitation process, if suitable hosts and hostesses are available, who are willing to co-operate in the progress of the patient. If patients are merely allowed to potter about earning small monies while provided with board and lodging, there is little gain, apart from the fact that the patient generally appreciates his greater liberty, but in many cases

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it is possible for the patient gradually to make progress from dependence to self-support, and even full self-guidance, which is true rehabilitation.

Relation with the Church.

The realm of psychological medicine is again bringing medicine into relation with the Church, from which it gradually separated in late medieval times. It is the role of the Church to succour, advise and assist those who are distressed in mind, body and estate.

Psychological medicine deals with those distressed in mind; when these are also disturbed in conduct the role of the doctor is freely conceded, but when the disturbed in mind are controlled in conduct, doubt arises. The presence of a real neurosis suggests the need for medical care, while a mere emotional disturbance in a comparatively normal individual may be considered the province of the Church. There is inevitable overlapping, but the line of safety is stepped over if some members of the Church accept fees for treating such cases. When specific symptoms need treatment the case is within the domain of the medical man. General assurance for patients without symptoms falls not unreasonably within the purview of the Church.

A very real difficulty is the different modes of approach adopted by these professions. The Church lays down certain prescribed inhibitions, whereas the trend of psychotherapy is to release inhibitions and so relieve conflict. It is important in a disturbed unstable patient not to upset the beliefs of a lifetime. Much judgment is required in regard to releasing inhibitions in cases where these have caused a complete psychological upset.

Essentially the psychotherapist, and the Church by confession, relieve the pent-up tension and mental turmoil taking place in the individual. The reaction is, however, differently dealt with, in the one case by seeking to relieve the conflict, in the other by shedding the conflict.

The solution to a difficult situation appears to be the psychological education of the Clergy, which is slowly taking place. A conciliation between the psycho-analytical standpoint and that of the Church is slowly being evolved. The dividing line between those requiring medical psychological aid while exhibiting no conduct disorder or lack of control, and those who are mentally disturbed emotionally, will always remain a close one, only to be solved by goodwill and co-operation between our two professions.

Psychiatric Education.

A first essential to progress is the education of the public and of the medical profession.

The education of the medical profession is vital and must start with the medical student, who is grossly handicapped by an absence of ordered instruction in normal psychology. It is the absence of such instruction which causes the many wild extravagances which those with poor judgment are liable to take up. If pathology were self-taught, like psychology, we should have just as many wild theories as to the bases of physical diseases. The difficulty is to find time in the over-congested medical curriculum. The proper place is with the teaching of physiology, but this stage is already overloaded, and it may have to be placed among or substituted for some of the preliminary scientific subjects.

This should form a basis for the whole outlook on the clinical subjects, and give the student the chance of always considering his patient as a whole, and not merely in relation to certain obtruded symptoms. He should then be taught to realize the mental aspects of every type of case, and not merely those in which this aspect is predominant. In fact, if he is capable of assimilating this teaching he will be taught to be a successful practitioner. The neurotic element will, if appreciated, enable an effective grip to be taken of such cases at an early stage. The general practitioner sees the whole situation spread before him, while the specialist is merely able to inquire, and at best have reports by social workers. All this will make for greater psychiatric progress, but full advances will only be made when teachers of general medicine are imbued with this broadened outlook. Essentially, development will follow the psychiatrizing of the medical profession, rather than the multiplication of the psychiatric specialist, although this also is necessary.

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The growth of psychiatric knowledge among teachers of medicine should result in students being required to know a more adequate amount about the neuroses, and even something about the psychoses. A separate compulsory paper, although desirable, is not likely in the immediate future, but the introduction of even a single question would compel the student to give attention to some aspects of a subject likely to affect his general outlook on medicine.

The education of the profession can hardly be complete unless a variety of aspects of social medicine are included. Eugenics and questions of population, housing, employment and industrial psychology all need close attention.

The education of the specialist has also been dealt with by the Committee of the Royal College of Physicians. The defect of the present Diploma is that people of very varied experience sit for a diploma which demands little in the way of actual experience of a variety of subjects on which they are liable to be examined, Those who know the neuroses may be ignorant of the psychoses, and *vice versa*, and both may be ignorant in regard to mental deficiency. It is most difficult for those living in the provinces to obtain practical experience in other branches than the one in which they specialize, and all find it difficult to gain experience in neurology.

The new proposals suggest following the American example of having a five years' course with three years' experience before sitting the examinations. A real specialist standard should then be obtainable, greatly increasing the value of the diploma—indeed raising it beyond the level of most other diplomas. This is probably all to the good, although the regulations will be more severe than those demanded by the F.R.C.S.Eng. and M.R.C.P.Lond., which have a proportionately higher reward, and it will severely limit those able to obtain such a diploma, and unless conditions change may be beyond the scope of the ordinary medical officer. It is to be hoped that such a diploma will attract the young neurologist and neuropathologist, which the present diploma fails to do.

Another issue is, what is to be the reward for all this study, allowing seven years to qualify in medicine and five years to study for the diploma? The recipient will average 30 years of age, and the money spent on education will, if invested, bring in as much or more on present values than the holder is likely to receive in pay and emoluments, some allowance being made for salary received after qualifying. For such an effort an increase of remuneration to at least £1,000 a year is essential. I do not say this to depreciate the need for a much higher standard in psychiatry, or for broadening the basis of education that all engaged in our specialty must attain if real progress is to be made. The effect of altering the basis of the diploma may be to alter the methods of staffing in the large institutions. It will be difficult, or impossible, to insist that all staff shall be qualified on such a high basis. At most, the two senior medical officers who, under present conditions, control the male and female sections of a mental hospital could reasonably be expected to be so qualified. This will leave a number of medical officers, some of whom will inevitably fail to qualify after many endeavours to obtain this diploma. The status of such officers, if retained, will be difficult. The ability of small hospitals to attract even one medical officer with such qualifications may be open to doubt.

With standard salary scales in the municipal services the basis is likely to be the size of the hospital, the turnover, and specialist qualifications. In the general municipal hospitals this may conceivably result in a medical superintendent being paid less than some of his officers, and it is possible that this may happen in a mental hospital when, with new appointments, a rigid standard of specialist qualification may be insisted upon.

A further issue is the question of the responsibility of the medical superintendent for all cases under his charge, Given specialist assistance, this is now being recognized as unnecessary in general hospitals. In special hospitals, such as those dealing with tuberculosis and mental disease, the medical superintendent is generally the most experienced specialist. Nevertheless, it is being appreciated as wrong that one individual should dominate all clinical activities, and possibly forbid treatments which are tending to become standard. The suggestion is that municipal hospitals, including those devoted to special services, shall have a medical committee like those who guide and help general voluntary hospitals. Our junior colleagues may rightly resent the power to curb their clinical activity. Such power is, in fact, not often exercised, and the fear is probably much exaggerated, but an

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alteration in regard to responsibility for clinical treatment appears necessary in the case of those who have passed the phase in which guidance is still needed.

The education of the public impinges on education in general. Psychology and psychiatry are slowly but progressively affecting and making more suitable and effective the education of the child. At the nursery school level indeed psychology has gained greatly by a study of the development of the child. As indicated in dealing with child psychiatry, the education of the teachers to think and act more psychologically is the key to the situation.

The biologist and medical man will both believe, and believe rightly, that education should concern itself more with the study of ourselves. The teaching of anatomy and physiology, at any rate to a first aid level, should become universal, and the removal of the taboo about the function of reproduction will allow real knowledge to take the place of much misleading information gathered as forbidden fruit. The astounding ignorance of young persons of both sexes about fundamental facts regarding themselves causes bewilderment and unhappiness. The teaching of proper physiology to replace lewd allusions will alone be a gain. With the extended school age it should be possible to teach elementary psychology before leaving school, so giving people some insight into the mainsprings of their conduct. The essential facts expressed in simple language and stripped of the less intelligible technical jargon is of intense interest to many people, both lettered and unlettered. The success of various " memory " courses depends on this fact, and proves the necessity and desire for such instruction.

Tuition to the public in respect to the abnormal is more open to doubt. The spreading knowledge as to the availability of help in mental stress is desirable, and perhaps some indication as to symptoms, but beyond this curiosity may be morbid without consequent benefit. Much propaganda on the above lines has already taken place in America, and has done a great deal to lessen the prejudices both of the profession and of the public. The necessity to train the highest type of intellect for the experimental and pathological aspects of our work I regard as of paramount importance. The late Sir Frederick Mott used to emphasize that without memory there could be no mind, and that without the brain there could be no memory, and that the brain depended on the general metabolism of the body. The importance of this truism has been again emphasized by the recent revival in physical treatments, and also by objective electrical observations on the function of the brain. In dealing with the mind it is foolish to neglect its mechanisms, and to ignore the stresses and conflicts which can occur, and which can be influenced by psychotherapy and alleviated by mental adjustments. The dramatic results produced by physical treatments, however, show how truly the mind is based on changes in the brain. The leucotomy results, even in chronic cases, lead up to the same conclusion, although here the relief of tension can be correlated with known physiological facts.

It is evident that our present methods are not ideal, and it seems certain that other methods will gradually be evolved. It is disappointing that so far the empirical methods of treatment have not given a better indication as to causation and pathology. The original explanations of convulsive therapy proved fallacious, and satisfactory explanations are slow to be evolved. The indications as to inherent instability and cerebral dysrhythmia exhibited by a number of cases show how difficult it may be to evolve satisfactory therapeutics, but there is evident work still to be done in explaining the sudden onset of acute schizophrenic and other psychotic episodes, especially when no evident toxic or vascular changes are present.

Organization of Mental Health Services.

In the recent Special Number of the *Journal of Mental Science* I have dealt with the problem of forming mental health services to correspond with the hypothetical regional areas which are envisaged as being self-sufficient for all medical purposes. The conception of such a service is incorporated in the official memoranda being prepared, and I only propose to comment very briefly on this.

The advantages of having mental health integrated with general medicine, both at the central and at the regional level, should be very great, and give a real impetus to our work. It has the overwhelming support of those engaged in other

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branches of the profession. Adequate expert psychiatric advisory boards should safeguard our liberties, and our chances of having our work stultified should be no greater than in other branches of the profession, who are also somewhat nervously preparing to safeguard their liberties and interests.

A central mental health board with a chief adviser will function at the centre, and be in touch with each region. There have been attempts to separate the health functions from the legal functions of the present Board of Control. These are rather inextricably mixed together in dealing with the certified person, since the legal aspect must be considered in any person detained against his will.

If Section 5 of the Mental Treatment Act is extended to carry temporary admission of both non-volitional cases and recent unwilling cases, the law again will have to intervene. When chronicity occurs detention may become inevitable, and a number of these persons will object to detention, although many realize that they need care.

Some people suggest that such legal help can be given by any lawyer, but, in practice, it is found that the lawyer familiar with the problems gives much the best advice, and even at times indicates to the medical profession where their legal fetters may suitably be relaxed. On the medical side a suitable medical adviser, supported by a body of experts representing all sections of psychiatric practice, offers the best hope of guided progress. The presence of independent advisers in close touch with actual work, particularly in the voluntary hospitals, and also in the research and other centres, gives hope of the beneficial effects of balanced expert opinion.

When we come to the local level certain benefits will be counterbalanced by some difficulties. The influence of a central university institute in which special cases can be received, supported and investigated by every pathological and other investigation offers the best hope of establishing co-ordinated research likely to advance psychiatric knowledge. The influence of such an institute is likely to raise the level of work in all the local mental hospitals. At present workers to man a series of such institutes have still to be found—a fact rather over-emphasized in the Goodenough Report.

The establishment of reception units for recent cases raises more controversy as to siting and type of case. The patients going into wards in a general hospital are always likely to be of the voluntary type, and although some of these may be fairly acute, they will only touch the fringe of the acute psychiatric problem. Instead, many of those in such a unit are likely to be of a milder type, with many who are only suffering from a moderate or mild degree of neurosis. The voluntary hospital tends to flinch from the more acute type of those who, apart from objecting to care, are liable to be offensive to the special senses, either by noise, disordered conduct, general appearance, or in other ways. It is open to doubt whether these should be received in the specialized wards of a local authority hospital, or whether special units should be built for such cases. There is much to be said for treating them in the wards of a municipal hospital, where all services are available, and if special units are established they will also need to be in close touch with a general hospital. The integration of all services so that workers in each section share in the work in other sections is most important. Out-patient work is essential to all types of worker in the specialty, and contact with various types of in-patient work is equally important. Each type of worker should be attached to out-patient units, and to units for receiving patients in the general hospitals, and other reception units as well, as being in touch with the long-continued treatment cases in the large mental hospital. When this has been achieved, the problem of siting cases can be considered dispassionately. At present the location of the worker greatly influences argument, but if all workers are in touch with all types of cases this difficulty will be eliminated.

I personally feel that the over-riding interest of the patient should decide the issue. There are many terrors to a patient in entering a mental hospital, one of which is that he may end his days there. This fear can be removed by separating those undergoing the earlier phases of treatment from those who need prolonged treatment. It cannot eliminate the fact that a number of patients recover at any rate to a social level after prolonged care, but it can separate those who recover, at any rate within a year, from those who need permanent or semi-permanent care. At present this is largely done by segregation within the mental hospital, but this

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does not reassure the public, and a definite separation of those needing temporary care and treatment from those who need permanent segregation seems indicated.

The success of the early treatment will depend entirely on public demand. The transfer to a more chronic unit will excite even more antagonism than is earned at present on admission to a mental hospital. It may, however, lessen the resistance to early treatment which at present handicaps endeavour to treat recent cases in a suitable environment.

While co-ordinated mental health services with central research units and proper attention to prophylaxis represent a great advance, there are certain disadvantages in the large mental health service which loom large to those at present free from such entanglements. It involves decisions being made by a higher authority, sometimes without knowledge of local conditions. It is generally feasible to safeguard main questions of principle by conferences of medical superintendents and others concerned, although at times instances have occurred in which political or other considerations have decided issues without a proper presentation of medical opinion. Delays in permission in the adoption of new treatments due to bureaucratic intervention have also happened. It is to be hoped that with proper advisory councils such mistakes may be avoided. It is, however, difficult to instil into those concerned with general administrative medicine a real appreciation of psychiatric problems, and there is always a danger that those who desire active progress in our specialty may have to give way to those who may fail to push our necessary claims. It is probably in minor matters that centralized control is most trying. Co-ordination and centralization also always results in even small decisions being made centrally. Those, being of little importance, are decided by junior officials, but when issued under departmental authority have the full weight of important authority and may cause local irritation. The inevitable rigidity of the regulations of large authorities also makes individual administration more difficult. Despite all these minor irritations, given proper safeguards, large co-ordinated mental health services are likely to give more efficient service to the patients and the community at large, and to make for progress in our work.

What is to be the future of our Association, which has done such pioneer work? It has taught and examined nurses, starting before those in the general hospitals. General Nursing Councils have now been established, and the question arises whether our nursing examinations should be continued. All agree that two examinations are undesirable; the only debatable points are, will sufficient nurses qualify under the General Nursing Council's Examinations to provide for public needs? Will the G.N.C. vary their preliminary examination sufficiently to make it more suitable for our nurses? Even with the diminished supply of nurses joining up in war time, our candidates far exceeded those sitting for the G.N.C. examinations, and in peace time the proportion was about 10 to 1 in our favour. Up to the present we have provided a book to cover the whole of our examination. The new edition, which has been greatly delayed by the war, is likely to consist of a psychological and mental part, and possibly a later issue of the rest of the original book. The reputation of the Association will somewhat depend on the efficiency of the Psychiatric Section of their text-book.

The Association, by its certificate in Psychological Medicine, used to provide medical men with a certificate of competence in the subject, but since the inception of the D.P.M. the certificate is seldom taken, although the Gaskell Medal is still the subject for keen competition. All this represents recession, or rather the handing over of our pioneer work to more suitable bodies. There is no sign of recession in the Society or its activities, and the establishment of new sections suggests a great increase in its activities. Beyond this, further prospects or visions suggest themselves.

Should the Association have a house of its own, like many kindred bodies? Houses are expensive in a central area, but this is a possibility depending largely on finance, important now that our resources as an examining body may be curtailed. Some have even suggested a College of Psychiatry, and dividing our members into fellows, members and associates by examination and selection. Considerable development would need to occur before this is possible, and indeed the issue arises, is it desirable? Many of us belong to some section of the Royal College of Physicians, which have recently shown marked interest in our subject. A number of us are officially designated Physicians in Psychological Medicine to various general

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hospitals; in some mental hospitals the designation "Physician-Superintendent" and "Assistant Physician" are used. For the present this seems sufficient.

I have endeavoured to indicate in this paper in the broadest terms some of the great opportunities which await our specialty. We still have much prejudice to overcome, and much education of the public and even of our own profession is necessary. We have, however, a vast opportunity to be of the greatest use to our fellow citizens, and it is up to us to grasp it with ability and discrimination. Our object should be to give our nation positive mental health, and so be of service to our generation.

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THE RELATIONSHIP OF ELECTROENCEPHALOGRAPHY TO PSYCHIATRY.*

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INTRODUCTION.

THE technique of electroencephalography has become to neurophysiology what the microscope is to histology. It is probable that by this technique neurophysiologists will achieve a comprehensive knowledge of the functional organization of the brain. While the EEG has been used most successfully for this type of research, it has also been applied with no less enthusiasm to clinical problems of neurology and psychiatry. In certain cerebral disorders, for example epilepsy, where knowledge had already made considerable advance, the EEG technique was immediately found to have application. But in what may be called " the problems of function " provided by the main psychiatric reactions of schizophrenia and manic-depression, and in relation to individual differences of temperament, intelligence and personality, in all these the EEG has so far proved of little value.

Hans Berger, himself a psychiatrist, developed theories about cerebral function based on the belief that the rhythms which he recorded from widely separated electrodes were an expression of the total function of the brain. Evidence that this global EEG is made up of numerous discrete rhythms arising from different cortical areas is provided by the finding that certain areas show rhythms peculiar to themselves—the alpha rhythm in relation to the visual association areas and the beta rhythm to the precentral areas being the best known examples.

Although many have recognized that the global EEG is a heterogeneous mixture of rhythms, yet the outstanding character of the alpha rhythm, which in many records seems to the unaided eye to be the only rhythm, has drawn attention to itself to the exclusion of other features. The alpha rhythm has therefore been subjected to careful and repeated scrutiny, and in fact has been regarded as if it alone constituted the total phenomenon to be observed.

It is my task to-day to review the position of electroencephalography and, while emphasizing the limitations for psychiatric research which are apparent in the technique, to point perhaps to one enormously important function which the method may aspire to fill. In the backrooms of psychiatry, neuropathologists, biochemists, endocrinologists and psychologists have long been busy forging chains of data, which, while they may have a tenuous relation to one another, rarely bear any obvious relation to the observed facts of behaviour, and even less to the subjective experiences of thought and feeling. In this respect the EEG certainly does not claim anything, yet it seems probable that the technique will form a bridge on which the several sciences can meet.

The record of electrical changes which is obtained from the brain is composed of a large number of rhythms, with frequencies varying from ½ to at least 30 waves per second. Some of these are discrete rhythms which stand out clearly for the eye to see and can be counted with no great difficulty. Others are not visible as separate rhythms, and their presence can only be judged by the manner in which they alter the shape of the visible waves. In addition, harmonics—the multiples of lower frequencies—occur in the EEG. Thus a fundamental rhythm of 2 waves per sec. may have its character altered by its harmonics, at 4, 6, 8, 10, etc., waves per second. These are some of the difficulties which confront the electroencephalographer who is making a naked-eye investigation of an EEG, and it illustrates a

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fact which is becoming increasingly apparent—that the more we know about the EEG the more difficult the phenomena are to interpret by the naked eye. It is to be recalled that among those who first recorded the EEG, surprise was felt that so complex an organ as the brain should produce so simple and apparently unchangeable an expression of its vital activity. No doubt, out of the present confusion of isolated facts and observations, laws will emerge ultimately, relating the mathematical data to the physiological functions.

Visual interpretation of the record has proved inadequate, and it is only when large, well-defined rhythms, or rhythms of peculiar character, stand out from the background, that they can be identified.

The significance which should be attached to these rhythms with their varying incidence cannot always be judged from observing the record alone. The completed data for such interpretation includes a knowledge of the physio-chemical environment of the brain. The distribution of energy at different frequencies, both in the normal and abnormal brain, is only constant while the chemical environment is constant. Attention to visual stimuli or the utilization of visual imagery for thinking brings about changed conditions, with rearrangement of energy in the cortical rhythms. Age, the psychological state of the individual and the concentrations in the cerebral blood of O_2 and sugar, the acid-base situation and the metabolic rate are among the determinants of the EEG picture. This field is still growing larger and only a beginning has been made in its exploration, though the results are not difficult to obtain and have wide application.

Constitution.

When we consider the relationships which the EEG characters have to the more complex phenomena of human behaviour and personality types, the findings have been discouraging. Superficially, some relationship might have been expected. The EEG records the developing patterns of cerebral activity from birth to adult life, and when a cerebral injury is suffered, the EEG provides the most sensitive indicator known of the process of repair and recovery. Indeed the EEG has been called the " ever-moving shadow " of the brain's activity. Some variation with the basic qualities of constitution, such as physique, intelligence and temperament, would not have been unusual. In the case of temperament, the introversion-extraversion scale which is known to have physical correlates again shows little relation with the EEG type. For extraverts a large amplitude alpha rhythm was claimed (Gottlober, 1938), and in a nearly related investigation the same was claimed for the cycloid personality, whereas the schizoid had a poor alpha rhythm (Lemere, 1936). But as Walter has recently pointed out (1944), this would suggest that extraverts use very little visual activity for their thinking, while introverts are largely dependent upon it. In these investigations, as in others related to schizophrenia, insufficient significance appears to have been attached to the state of tension or relaxation of the subject. It may be that the introvert shows little alpha rhythm because he responds to the novel situation of the test by an increased alertness, possibly coloured by anxiety, while the extravert is much less disturbed by the same situation. It seems unlikely at the present time that the main characters of two such complex series of phenomena—the one at the level of human behaviour and the other at an electrical level, should show such a simple relationship. At the physiological level, however, positive results are to be found. Golla, Hutton and Walter (1943) have shown a relationship between the type of alpha rhythm and the type of habitual imagery used in solving problems. Those dependent for their thinking on intense visual imagery tend to have least alpha rhythm, while those unaccustomed to visual imagery have a persistent alpha rhythm.

The last component of constitution with which I shall deal is heredity. The EEGs of identical twins have identical characters, whether they be normal or abnormal. The Harvard studies recorded the presence of EEG abnormality in 60 per cent. of the total relatives in a group of epileptics, and in one or other parent in 95 per cent. of epileptic children. On the basis of these investigations, it was suggested that the main characters of the cerebral rhythms were determined by genetic factors, and that epileptics were predisposed to fits by reason of a hereditary cerebral dysrhythmia. Various attempts to particularize the genetic influence have been made, the Harvard studies suggesting that it is a single dominant gene.

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Further research will, however, be required before this matter can be settled. But the conception has been extended further. In view of the high incidence of abnormal EEGs among psychiatric material generally, Williams (1941) has stated that its possession predisposes the individual not only to epilepsy, but also to psychosis, neurosis and psychopathy. We are faced, however, with the fact that this " non-specific EEG abnormality," which comprises by far the largest group among psychiatric cases, is not a homogeneous abnormality. As I have already indicated, its heterogeneity cannot be identified by the naked eye. The surprising results which occur when one deals with the " non-specifically abnormal EEG " as if it were a single entity is illustrated by some recent work relating to the prognosis of war neuroses (Heppenstall, Hill and Slater). The presence of an abnormal EEG in 300 soldiers passing through a neurosis rehabilitation centre bore no relation to whether they were subsequently invalided, subsequently only able to do light duties, or continued in their units free from symptoms. Yet when a single abnormal component was considered—abnormally fast rhythms—it proved of bad prognostic omen.

In considering the influence of genetic factors, yet a further difficulty confronts us. It is well known that the cortical rhythms change throughout the period of physical growth of the brain. The process may not be complete until the last association tracts are myelinated, for it is certainly not always so at puberty. The delta rhythm which appears dominant at birth gives way to the dominance of faster rhythms, and the general trend is for more energy to appear in faster rhythms until the adult type alpha rhythm is dominant. In the " normal " individual at 18 the slower rhythms have disappeared to naked-eye examination. While this account is certainly an over simplification, there is evidence pointing to a maturation process in the brain, of which the stability of the EEG characters is one of the outward and visible signs. Evidence for this was found by Walter and Dovey, who demonstrated that in epilepsy there is a decline in the percentage of abnormal records with age. Similar findings for the incidence of abnormal EEGs considering the age at which a head injury is suffered have also been demonstrated (Heppenstall and Hill). Again, voluntary hyperventilation, which will produce delta rhythm in 40 per cent. of normal children aged 14–17, only does so in 30 per cent. of adult controls under the age of 50, and in our experience is extremely rare over 50. There is then a process which can be called " maturation," and this makes the problem of investigating the influence of genetic factors even more difficult. Where a gene exerts its influence at a single time and its effects are present thereafter, as for example in the case of the gene determining the blood group, it can be recognized readily. But when its influence is potential, or when its action is spread out over a period of many years, influencing the normal developmental process—as indeed, according to J. S. Huxley, many genes do—then its presence can only be recognized if the developmental process is fully understood. Since from EEG data there are at present no sure landmarks in the brain's maturation process, the whole problem will not, I think, be elucidated yet. While discussing this matter, reference may be made to the EEG abnormality in psychopathic personalities of the aggressive type. In a high percentage of EEGs in patients of this class an abnormal amount of energy is seen in the theta band—usually at 4–6c/sec. in the parietal and temporal areas on both hemispheres. By automatic frequency analysis Walter has recently found theta rhythm to be a normal characteristic of the parieto-temporal areas, although in the normal EEG the rhythm is of such low voltage that it is barely apparent to visual observation. With the exception of the clinically severer cases in which a temporal slow focus is seen, the EEGs in the psychopaths would pass for normal in children of 12–15. Yet it is interesting that theta rhythm, the abnormality in the adult psychopath, is also found *in excess* in the behaviour problem child of the same type. A cortical immaturity has been postulated in these cases—a failure to reach the adult types of rhythm—but we are no nearer to knowing whether this is the result of a genetic factor whose action is spread out over a considerable period of time, or due to one of a great number of other possible acquired factors. The relationship which these cases bear to epilepsy gives slight support perhaps to the genetic theory.

The question of genetic determination is, of course, directly associated with the problems of maturation, to which I have referred. Maturation may be related not only to the dominance of any one frequency in any one area for a given age,

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but also to the dominance of one hemisphere over the other. Mrs. Gibb has recently made a very careful study of the characters of the alpha foci. She finds that the focus on the left side shifts more frequently than that on the right and is more responsive to arousal stimuli. The greater stability of frequency, the greater amplitude and the relative inactivity of the alpha focus on the right side indicates, as Mrs. Gibb points out, that this focus is less susceptible to the influence of external stimuli than that in the dominant hemisphere. In the severest forms of aggressive psychopathy asymmetry of rhythm is frequently present, and the temporal lobe theta rhythm focus is most commonly found on the right side. The presence of asymmetry of pyramidal function and the association of lesions of the right hemisphere with mental symptoms was recently reviewed by Fleischhacker. The observation was first made by Hughlings Jackson, who called the left hemisphere the more objective and voluntary, and the right the more automatic, but what connection the EEG data have with cerebral dominance is not at present clear.

To the electroencephalographer the realization soon comes that his findings can only be interpreted clinically if the history is known. A local focus of abnormality may itself strongly suggest an acquired cerebral lesion, even though the lesion is the result of prolonged functional change in, say, the blood supply. The history of trauma or encephalitis or symptoms suggesting a neoplasm puts the EEG finding into its clinical setting. Although it is true that special wave forms tend to be associated with tumour or atrophy, yet by no wave form alone can a tumour or atrophy be diagnosed. Experience may in time correct this, but since, even with an abnormal focus present in an EEG, the problem of whether it is of acquired or constitutional origin is still in doubt, how much greater is that doubt where the EEG shows generalized abnormality and no focus can be found. This question, frequently asked, may be incorrect. Possibly we should restrain ourselves to asking whether a focus, if present, is associated with a structural or only a local functional change in the brain. Unfortunately even this cannot always be answered with certainty. But it would be unwise to assume that structural changes, extremely small as Penfield has shown they may be, are always the result of an exogenous factor.

Aetiological Problems.

In certain aetiological problems of the constitutional psychoses electroencephalography has made a contribution. While it is generally conceded that no specific EEG disorder is associated either with the manic depressive or schizophrenic reaction types, the EEG has been profitably applied to the old problem of the relationship of schizophrenia to epilepsy. The Harvard workers found a type of organized theta discharge commonly among schizophrenics. This suggested that similar abnormalities were to be encountered in epilepsy and schizophrenia, indicating a similar disorder of function. Lennox has since stated that this was an erroneous conclusion, and now believes that schizophrenics who demonstrate such EEG abnormalities are atypical and may be called symptomatic schizophrenics, analogous it may be thought to those states commonly encountered in young children with organic brain disease, and not uncommonly in adults with acute G.P.I.

It can be argued that the study of epilepsy by the EEG, as indeed the study of the various clinical pictures seen in neuro-syphilis or encephalitis has already done, has shown us that the main reaction types have a varying aetiology. Symptomatic schizophrenia associated with cerebral dysrhythmia probably bears little relation to the schizophrenic process originally called dementia praecox, nor indeed does symptomatic schizophrenia seen in G.P.I. This will probably find general agreement, yet it was little appreciated by those who hoped to find diagnostic criteria for the major psychoses from a study of the dominant pattern of the cortical rhythms. It would only seem justifiable to relate the characters of the EEG to the physiological substratum of the mind. The same physiological stress—hypoglycaemia for example—will in one produce irritable aggressiveness, in another amorous cheerfulness, and in yet a third anxious silence, yet the qualitative electrical changes *when they occur* may be much the same in all three.

The following cases illustrate the association of cerebral dysrhythmia with first a symptomatic schizophrenic state, secondly a symptomatic depressive state, and thirdly a depressive state of unknown aetiology.

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CASE 1.—A young merchant seaman, aged 20, was admitted from a Seamen's Convalescent Home. He was there because he had been anxious and depressed while at sea. After a few days he had developed an attack during breakfast in which he left the room and was found staggering in a corridor. He was put to bed and given chloral and bromide and slept until the afternoon, when he attempted on two occasions to leave his bed. He was then very restless and excited, and was regarded by lay observers as hysterical. Morphine, gr. ¼, and further doses of chloral and bromide failed to control his behaviour, but two hours after an injection of luminal, gr. 3, he became rational for over an hour, only to relapse again and remain " excited " for most of the night. By 8 a.m. the following morning he had fully recovered.

On admission the patient admitted previous attacks over a period of two years. In one hospital chorea had been diagnosed, but the movements which he again showed were not choreiform, but quasi-purposive. They were particularly severe in the left shoulder and arm, and were much worse when attention was drawn to them. He said that associated with his attacks was an abdominal pain and occasionally he would feel giddy, and once had fallen with brief loss of consciousness. He had experienced considerable stress at sea and had lost his brother in the service. He said he longed to avenge the latter's death, and in addition, having no home to go to, felt that he must return to sea, which he dreaded. At first the illness was regarded as of psychogenic determination—a superficial hysterical escape from his anxiety. He was told that he would be recommended for discharge from the service and was put on modified insulin therapy. Thereafter his attacks became more frequent, due, as was subsequently inferred, to the hypoglycaemic trend. These attacks were observed, and further investigation revealed that the acute behaviour disorder was preceded by a change of personality. He was normally cheerful, friendly and sociable, but he became seclusive, irritable and suspicious. After the attack was over he could discuss it freely. He said that sometimes he felt giddy at the start. For a few hours he would observe other patients watching him, would feel they were talking about him and were unfriendly. During this stage he could control his thoughts and behaviour, but later he would hear voices telling him to commit suicide and then he would not have charge of his own thoughts or actions. He would be impelled to walk off and to seek his own destruction. He was seen on two occasions while in hospital making for a railway line, and had to be restrained once and could be persuaded back to his ward on the other occasion. It was difficult to assess accurately the quality of what appeared to be a primary thought disorder, the patient only replying that during the attack his thoughts were not his own and that he was controlled by his single suicidal impulse. He found the hallucination very distressing. In these attacks he was acutely antisocial, seclusive, paranoid, hallucinated and impulsive. The thought disorder bore resemblance to schizophrenic disorder. Consciousness in the two attacks observed remained normal for orientation throughout and there was no subsequent amnesia.

Many characters of these attacks obviously suggested an epileptic aetiology, and this was supported by the EEG, which shows a generalized cerebral dysrhythmia of both fast and slow frequencies. No abnormal physical signs were elicited, but the secondary hair was of female distribution. His physique was predominantly athletic. The modified insulin treatment was stopped and anticonvulsants given, after which no further attacks occurred during six weeks and he was discharged to continue treatment.

CASE 2.—In the second case, that of a woman, aged 36, the history of epilepsy is more definite. From 22 until 27 she had brief " absences," and since then has had, periodically, major convulsions which have been witnessed in various hospitals. About eight years ago, when in Maida Vale Hospital for investigation of these fits, a persistent left parietal focus of abnormal potentials was found by Mr. Grey Walter and subsequently the skull was opened, but no abnormality was found in the cortex. Soon after the beginning of the war her major attacks became more frequent, and at this time she began to suffer from psychomotor automatisms, in some of which she lost consciousness; in others she suffered horrible but indescribable physical sensations, and in these would at times laugh immoderately and behave in a hysterical manner. Since the beginning of the war, when she came under my observation, her major fits, absences and severer attacks of automatism have gradually ceased. Routine EEGs have been taken every few months, though less frequently during the last two years, since her clinical condition has improved. During 1941, when she was having major fits, numerous attacks of *petit mal* were seen in the EEG records, but the resting focus, originally found in the left parietal area, was seen to move from one side to the other and had no constant position. Since 1942 she has been seen at monthly intervals and has had no further major convulsions, but on four occasions in 1943 she suffered from attacks of feeling dazed and unreal and in one of these she fell and hurt herself. The attacks which she suffered towards the end of 1944 had, however, a different quality. These started with a marked feeling of depression and she was observed to be quiet and pale. She would just sit at home and cry, apologizing for her incapacity. After 24 hours a new symptom developed. She now felt strange: " I know myself but in the distance. A queer sensation all over. I was sitting in an armchair, and although I was there I was away from myself. I get a heavy head and my eyes droop. I am frightened of myself. I worry over the least thing."

This feeling of unreality relating to herself lasted 2–3 days, and while it was on she could carry on with her work—a routine factory-belt job—but felt very depressed and cried if spoken to. This attack was of some interest, since we were able to record her EEG during and after it. This indicated that the EEG was changing in character at the time. A fast rhythm on the left

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side, which had been present for some months, was still apparent during the attack, but was less evident after it.

This patient has never been considered neurotic. She is of a friendly, sociable disposition, and has a record of persistent employment which does her credit, considering her disability.

CASE 3.—The third case, a man, aged 35, had between the ages of 15 and 20 suffered from attacks of falling with self injury, without loss of consciousness, but with aphasia and inability to move. These attacks recommenced two years ago, at the age of 33, and continued until the onset of his present illness, when they ceased. Between 5–6 a.m. one morning in October, 1943, he woke up to feel he was dying—a strange, indescribable sensation. Within a few hours, attacks of vertigo commenced with a feeling that he was falling to the left, each attack lasting 20–30 minutes, and associated with panting for breath and tachycardia. He improved after a few hours, but every night for two weeks had a mild recurrence. He then became depressed, could not sleep, and was very worried by his attacks. In these he became very cold, then broke into a hot sweat. He said that in the attacks he could see people " but not know them." " I don't feel I belong to this world at all. I have a feeling I am actually dying all the time." The attacks of vertigo ceased when he was given luminal, but the unreality feelings did not, and he now experienced strong obsessional compulsions to kill himself and the constant idea that his wife must die too. A little later he felt that he must kill his children. These ideas had a true obsessional quality and were strongly resisted. This patient's EEGs showed a left temporal focus of low voltage theta rhythm. He has been under out-patient treatment for nine months and has gradually improved. His obsessional ideas come and go, he has had no further attacks of vertigo, but occasionally in the evenings still has attacks of what he calls " unawareness." His depression has steadily left him.

This man has a bad family history. His father was treated at the Maudsley Hospital as an out-patient for an involutional depression. His mother, following a pregnancy, developed a nervous illness lasting some months in which she " believed she could not see properly." This symptom is of interest, since the patient himself had a disorder of reality feeling, and since his younger brother also suffered from it. This brother, now doing well as an officer in the R.A.F., was at the age of 17 a patient in the Maudsley for some months. He had anxiety attacks and obsessional preoccupation with his vision. There was a history of attacks of migraine with a right-sided teichopsia and hemianopia, but superimposed were obvious feelings of unreality about the external world. I am quoting from the notes of Dr. Aubrey Lewis, his doctor at that time. The patient said : " To all appearances I am blind, although I can see. I can hear all noise ; I can hear myself talking, but it seems I am sitting here without sight, although I can see you. When I look at you I can see, but there's something not there that ought to be."

The first of these cases indicates, I think, the presence of an undoubted epileptic process. Here the EEG was valuable, but the symptoms could be interpreted clinically as epileptic.

The second case had undoubtedly had epileptic fits, and it would seem reasonable to suppose that her short depressive attack was in some way related to her epilepsy. EEGs taken before, during and after this attack did not show a type of rhythm commonly seen during epileptic fits. These records do, however, indicate a process of change occurring in the brain.

I have quoted the third case at some length, since both clinically and from the EEG the diagnosis of an epileptic disorder is not certain, although from both points of view there are suggestive features. The symptoms in this type of case would seem to be related to the epilepsies, but probably not in the sense that a sensory aura is related to the electrical discharge in the brain which accompanies it. The third case showed resemblances to the second in that the symptoms did not appear to be associated with a definite epileptic discharge in the EEG. The aetiology in these three cases, which in greater or lesser degree is related to epilepsy, is still obscure despite the EEG. They demonstrate the caution necessary when associating cause and effect between dysrhythmia and the symptoms in any given case.

CEREBRAL HOMEOSTATIC MECHANISMS.

Another view of the relationship between electroencephalography and psychiatry is provided by the clinical and EEG changes accompanying alterations in the contents of the cerebral blood.

One of the earliest discoveries in electroencephalography was that respiratory alkalosis tended to produce high voltage delta rhythms in susceptible people. While at first this was thought a characteristic of epilepsy, it is now realized that about 70 per cent. of individuals with abnormal EEGs from any cause will exhibit

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the phenomenon. It would seem to be a normal character of early childhood, the brain becoming more stable to alkalosis as age increases. The brain's sensitivity to respiratory alkalosis is markedly increased by a low blood sugar, and is less sensitive as the blood-sugar level is raised. It has thus been demonstrated that the stability of the brain to one chemical stress is varied by the presence or absence of another. The effects of alkalosis can in fact be countered by the maintenance of a high blood sugar.

Does the occurrence of delta rhythm in response to overbreathing have any practical bearing on psychiatric problems? Probably yes. The hyperventilation syndrome occurs in the anxiety attacks of hysterical persons and frequently in cases of effort syndrome (Sargant). Hyperventilation has been found to be a factor causing giddiness and amnesia during high flying (Rushmer and Bond), and has been suggested as a factor in psychopathic crimes of violence (Hill, Sargant and Heppenstall). It has been known for some years that it is possible for normal people to overbreathe themselves into unconsciousness, but more recently the finer grades of impairment of consciousness have been noted during the appearance of delta waves (Davis and Davis; Davis and Wallace), which in susceptible people appear after 30–60 seconds' deep breathing. This is thought to be due to vasospasm consequent upon CO_2 lack. The delta rhythm first appears in the frontal areas and gradually involves the whole brain, so that finally the rhythm can be obtained from any area. The rhythm is usually of high voltage, and at this stage cannot be distinguished from the discharges seen in physiological and pathological states of quite a different sort. For example, delta rhythm is seen in generalized cerebral oedema consequent upon high C.S.F. pressure and it is seen also in deep anaesthesia. The rhythm can be induced in young patients by many electric fits repeated without due intervals between them.

In the numerous instances, both physiological as well as pathological, in which delta rhythm is dominant in all cortical areas, unconsciousness or dulling of consciousness is the invariable clinical accompaniment. Yet from the appearance of the waves themselves, it is at present impossible to say whether consciousness has not yet fully developed as in infancy, whether consciousness is only dimmed as in the delirium of the post-concussive, or whether consciousness is completely absent as in deep anaesthesia. If a degree of consciousness persists the delta discharge may be accompanied by normal or abnormal behaviour, by subsequent amnesia or by no amnesia. It seems probable that only when delta rhythm is dominant in all cortical areas is any serious degree of change of consciousness present.

Looked at from the point of view of the maintenance of dynamic equilibrium within the organism, respiratory alkalosis is seen as a dangerous threat, which will ultimately result in a breakdown of the controlling mechanisms of cerebral metabolism. These mechanisms and the failure of homeostasis as a result of which delta rhythm appears in the EEG have been the subject of investigation by many workers, but notably by Darrow *et al.* in Chicago and Gibbs *et al.* at Harvard. Their work indicates that when as a result of overbreathing the arterial CO_2 falls the blood pressure also falls, and it is only when this ceases or the fall is not maintained that a CO_2 deficit occurs in the cortex. Until this happens no change is seen in the EEG. Only when the blood pressure stops falling is the CO_2 in the brain necessarily reduced and cerebral vasoconstriction to be assumed. At this point an excessive vasospasm is offset by a reinforcement of the parasympathetic tone, increasing the acetylcholine depleted by the alkalosis; so that on the one hand excessive vasospasm does not occur, and on the other, adequate acetylcholine is conserved for synaptic transmission. But if this parasympathetic reimbursement of cholinergic activity itself fails, local and excessive vasospasm may result, with consequent interference with cerebral oxidation and the development of delta activity in the EEG.

Convincing experimental evidence has been furnished by Darrow and his colleagues by cutting, by stimulating, and by paralysing the recently discovered parasympathetic nerve supply to the cat's frontal lobes. The outcome of this work is that a parasympathetic control of brain waves has been demonstrated, which may have very important significance for psychiatry. Darrow writes: "We would mention a possible implication of these findings. There is here a mechanism by which emotionally induced autonomic changes possibly exert an

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influence on the brain. We are provided pathways by which chronic emotional upset, especially when in association with spontaneous hyperventilation, may possibly exert an influence on both electrical activity and cerebral circulation."

The manner in which the autonomic nervous system preserves the dynamic equilibrium of the organism, and the various ways by which emotional upset tends to break down that equilibrium, have resulted in the broad concepts of " vagotonic " and " sympathicotonic " type of individual. It is unfortunate that, through complexity of innervation, very few tests to establish these differences are valid. Darrow has pointed out that tests of autonomic balance are, in general, of two types: firstly, those which examine the reaction of the organism or of some of its organs to a specific autonomic stimulus, and secondly those which, imposing a more or less non-specific though regulated load on the organism, attempt to measure the efficiency of the machinery for maintaining equilibrium. Since in most instances it is impossible to say whether a given result is due to inhibition of the one, or excitation of the other type of autonomic innervation, one must be content to consider only the second group. Such tests are not strictly tests of autonomic activity, but of total effect of a variety of homeostatic mechanisms in handling a new situation—the stress given.

The electrical reaction of the brain to the stresses of alkalosis, low sugar, low oxygen tension and the like can be estimated even by the naked eye, if only coarse changes are admitted. Delta rhythm does not appear in the EEGs of normal individuals until the blood sugar falls between 40 and 30 mgm. per cent. Using this fact, 80 units of insulin have been given to controls, epileptics, psychopaths with abnormal EEGs and chronic schizophrenics (Heppenstall, Shaw and Hill—unpublished). As a group the epileptics and the dysrhythmic psychopaths could be distinguished from the controls, since delta rhythm appeared in the EEG at sugar levels above 40 mgm. per cent. Of greater interest is the fact that the chronic schizophrenics also could be distinguished as a group, since they either did not produce delta discharge at all, or if they did, it appeared at levels of blood sugar below the range of the controls. The few exceptions among the schizophrenics were those in whose personal or family histories epileptic phenomena had occurred. These tests, with which we have made only a beginning, and which in the case of schizophrenics are complicated by the factor of insulin resistance, require further verification to establish their validity. But they illustrate again the well-known concept of a lack of stability in the epileptic brain, and an increased stability in that of the schizophrenic.

A similar type of stress test has been developed by Heppenstall, using respiratory alkalosis and hypoglycaemia as the chemical variables. Raising the blood-sugar level tends to inhibit the delta rhythm produced by some individuals on voluntary over-breathing. Mention has already been made that one of the indications of a maturation process is the decreasing incidence of this phenomenon as age increases. In children it is very common, whether fasting or not, but the level of the blood sugar is very important in the adult. When fasting, about 70 per cent. of all patients with abnormal EEGs produce delta rhythm on severe overbreathing, but if the blood sugar is raised above 130 mgm. per cent. the phenomenon is inhibited in all but the epileptics and certain psychopaths. It is not at present clear whether the cerebral instability consequent upon a traumatic lesion or that consequent upon other factors can be differentiated by the method, but this test as well as that developed by standardized hypoglycaemia presents us with new data and a new approach. The principles upon which the tests are founded are now a commonplace in medicine. They are analogous to the familiar exercise tolerance, urea clearance, liver detoxication tests and the like, in all of which an organ or system is subjected to a known stress and its reaction measured in a certain way. Like them, however, the way in which the brain deals or fails to deal with the stress is not indicated by the nature of the test.

These two tests of cortical electrical stability once again emphasize the inadequacy of the visual method of interpreting the EEG. When decision as to the " point of change "—the occasion when theta or delta rhythm significantly replaces alpha as the dominant pattern—is made by the naked eye, that decision is necessarily determined in greater or lesser degree by subjective factors. The eye is a poor analyser. These limitations for electroencephalography have been known for some time. An apparatus for analysing the amount of energy at the different

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frequencies was developed by Grass in America in 1938, but in practice the device suffered from the fact that lengths of the record were analysed after it was taken. The EEG was not analysed as it was produced. A brilliantly conceived invention of Mr. Grey Walter's has, however, provided an apparatus which produces a continuous analysis of the EEG which proceeds as the EEG is taken, the analysis being recorded over the primary record which it represents. It is clear that the use of this apparatus will not only lead to greater knowledge of the nature of the EEG, but will also obviate the subjective factor in interpretation, and make good the deficiency so apparent in the human eye.

If one may venture a prophecy about the future of the EEG for psychiatry it would be this: The time is past when the consideration of large numbers of EEGs from any clinical type is likely to produce data of significance. While for the neurologist the identification of the space-filling lesion, the epileptic focus and the cerebral atrophy may be assisted by the primary EEG record, in the case of the problems confronting the psychiatrist this is not so. For him the data will be more complex, and the concepts within whose framework the data can be understood will involve such terms as "maturation," "stability to stress" and the like. Of the homeostatic mechanisms involved in this most complex chapter of physiology, knowledge is very incomplete. If at present electroencephalographers can see maturation of the brain in electrical terms as a vague though probable concept, they must translate this process into terms with which the psychiatrist can work.

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A SCREENING PROCEDURE FOR THE SELECTION OF RECRUITS FOR PSYCHIATRIC INTERVIEW.

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IN the opinion of psychiatrists it should be possible to detect at the time of recruitment a considerable proportion of those later destined to prove unsuitable owing to psychiatric disabilities. Examination by psychiatrists, however, takes a considerable time, and it is impossible for them to examine fully more than a certain proportion of entrants. Thus, in all countries during the war the need has been felt for a preliminary screening procedure to indicate those for whom a full psychiatric interview is desirable. It is the purpose of this paper to outline a method differing in certain ways from those previously described.

It may be recalled that the principal recorded methods of psychiatric screening consist, either singly or in various combinations, of—

(1) The somewhat haphazard reference of candidates who at any stage strike their examiners as behaving in an unusual or queer manner.

(2) Very brief examinations (3 minutes or sometimes considerably less) of all candidates by trained psychiatrists who try to spot those who need a more prolonged examination.

(3) Questionnaires, such as the Cornell Selectee Index.

(4) Intelligence tests, both to pick out the subnormal by low scores and the unstable by scattered or discrepant scores.

Psychiatrists in Great Britain have been too deficient in numbers, and perhaps also in stamina, to make the second method a practical proposition. The third method, the psychiatric questionnaire, suffers from the defect that it is unreliable except in those who are bright and literate. The indirect approach by way of intelligence tests does not appear to have proved successful; a low score indicates dullness and not neurosis, and the hopes that an unequal performance may pick up instability with any reasonable efficiency have not been realized.

The method to be decribed frankly uses the art of direct questioning as the main weapon in order to elicit points of psychiatric significance, intelligent women with little specialized training being used for this purpose. We believe that the flexibility of this procedure more than compensates for the loss of objectivity as compared with the questionnaire method, for each essential topic can be presented to the individual candidate in the most suitable way.

When the present procedure for recruitment into the Navy was being organized in the late summer of 1941, it was decided to appoint selected members of the W.R.N.S. (Wrens) as assistants to the naval recruiters. The naval recruiters were chief petty officers, or of equivalent rank, whose duty it was to interview all men who volunteered for the Navy, or who had expressed a naval preference at the time of their call-up for national service, the accepted proportion varying from time to time with naval needs. These selected Wrens were only given a very brief course of training, though they were subsequently supervised by experienced psychiatric social workers, whose arduous task it was to travel round so that the practical tuition of the Wrens should continue. (The supervisors were originally three in number for the whole country, but for unavoidable reasons were soon reduced to

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two, and finally to one.) Instructions were provided to guide the Wrens in making inquiries into each man's past record, and in asking certain additional questions when checking up the simple forms which all naval candidates had to fill up. (These instructions are set out in Appendix 2.) The duration of the Wren's interview with any candidate seldom amounted to more than 8 minutes.

It was hoped that in the case of markedly unsuitable candidates information would be elicited which would make it clear to the naval recruiter that the man was not worth taking and should therefore be rejected. It was further hoped that in a higher proportion of cases, whilst the information elicited might not be such as to justify rejection, it would nevertheless indicate the desirability of a psychiatric examination when the man reached his training establishment.

In order to investigate the efficiency of the procedure, two experiments were carried out.

The First Experiment.

In the first experiment, Wren assistants to naval recruiters interviewed a number of neuropsychiatric cases under treatment in the neuropsychiatric unit of a naval hospital, together with surgical and medical cases to act as controls. The selection of both the psychiatric and control cases was of the simplest description, for it so happened that at the time of the experiment there was an unusually large number of vacancies in the hospital. Consequently, it became necessary to select all the patients who were in a fit condition, either physically or mentally, to proceed to the examination hall. Moreover, it was necessary to supplement the controls by adding 11 stokers, members of the hospital fire party, who were not patients at all.

Approximately equal numbers of neuropsychiatric patients and controls were present at each session, and the Wrens did not, of course, know to which category a man belonged. After each session the Wrens went over the forms they had completed, dividing them into those they would have classified as positive or negative at a recruiting centre.

It is true that the neuropsychiatric cases were interviewed after their breakdown had occurred; the Wrens were, however, instructed to confine their inquiries very carefully to matters of fact which had preceded the man's entry into the Navy, and to ignore any information volunteered regarding his service career. The whole procedure was carried out exactly as at a recruiting centre. A short battery of group intelligence tests was also applied.

It became clear on inspecting the forms that the reasons for considering the findings as positive fell into two main categories: First, "mental": for example, a past history of a nervous breakdown, or a long period of disability following head injury. Secondly, "physical": for example, gastric or chest complaints. It will be realized that the Wrens were instructed to report physical complaints which might be indicative of psychiatric disorder; but since the majority of controls were hospital patients, they naturally picked up an undue proportion who gave a past history of physical ill-health.

Table I shows the numbers and percentages of cases of neuropsychiatric patients and controls classified as positive or negative by the P.O. Wrens, together with a further division of the positive cases into those so classified on mental or physical grounds respectively:

TABLE I.

	Number.	Percentage.
Neuropsychiatric cases:		
Positive on mental grounds	22	41
,, "physical" grounds	4	8
Negative	27	51
Total	53	100
Controls:		
Positive on mental grounds	7	13
,, "physical" grounds	12	21
Negative	37	66
Total	56	100

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With one exception all the control patients classified as positive by the Wrens were examined psychiatrically. One stoker was not available as he had been removed to cells for punishment. Table II shows in each case the reason why the Wren classified the man as positive, the hospital diagnosis and the psychiatric findings:

TABLE II.—*Details of Controls Classified as Positive by the P.O. Wrens.*

	Positive history elicited by Wrens.	Hospital diagnosis.	Psychiatric findings.
	Positive on Mental Grounds.		
1.	Nerves and chest	? Bronchiectasis	Chronic anxiety state.
2.	Faints	Vasomotor instability and ? recent ulcer	,, ,, ,,
3.	Nervous breakdown and gastric	Nervous dyspepsia	Hysteria.
4.	Turns	(Stoker—staff)	Stable dullard.
5.	Nerves	Nervous dyspepsia	Negative.
6.	Chest and fatigability	Effort syndrome	,,
7.	Headaches	Headaches, ? eyes	,,
	Positive on Physical Grounds.		
1.	Gastric	Pleurisy	Constitutionally inferior.
2.	Weak bladder	Enuresis	Enuretic dullard.
3.	Gastric	Nervous dyspepsia	Negative.
4.	,,	Gastric (ulcer)	,,
5.	,,	(Stoker—staff)	,,
6.	,,	Fractured tibia	,,
7.	Gastric and chest	Gastric (ulcer)	,,
8.	Chest	Effort syndrome	,,
9.	Asthma	Asthma	,,
10.	Rheumatic fever	Fractured pelvis	,,
11.	Giddiness and ear trouble	? Menière's syndrome	,,
12.	Chest	(Stoker—staff)	Not seen (in cells).

It will be seen that no less than 3 out of the 7 controls classified as positive on mental grounds were found to be positive on psychiatric examination. Thus, if references on mental grounds only are considered, 22 out of 53 neuro-psychiatric cases were picked up, whilst out of 56 controls only 4 were judged positive without this finding being substantiated on psychiatric examination. As has been pointed out, classification as positive on physical grounds was, in any event, likely in the case of hospital patients.

Turning to the neuropsychiatric cases, Table III summarizes the diagnoses in relation to the Wrens' classification:

TABLE III.—*Diagnoses of Neuropsychiatric Patients in Relation to the Wrens' Classification.*

Diagnosis.	Total number.	Number positive on mental grounds.	Number positive on physical grounds.	Number negative.
Affective	19	6	1	12
Hysteria	8	6	2	..
Psychopathy	6	2	1	3
Schizophrenia	2	1	..	1
Mental deficiency	3	2	..	1
Post-concussional	8	2	..	6
Epilepsy	4	2	..	2
Enuresis and stammer	2	1	..	1
Organic mental reaction	1	..	..	1
	53	22	4	27

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The results of applying group intelligence tests were negative, apart from the discovery that the 11 stoker controls were of lower average mentality than the other controls or the psychiatric patients—a point not relevant to the experiment. Comparing these last two groups there was no appreciable or systematic difference in mean performance, nor was the psychiatric group more variable.

The Second Experiment.

It was decided to repeat the first experiment on a somewhat larger scale, and to include a sample of psychiatric out-patients with normal naval ratings to serve as their controls. This experiment was carried out at two naval hospitals and at a naval barracks. Four P.O. Wren assistants to naval recruiters carried out all the interviewing.

Those interviewed comprised:

(1) 97 neuropsychiatric in-patients who included all whose condition made it possible for them to proceed to the examination room and co-operate in an interview.

(2) 77 in-patient controls from the surgical and medical wards. Gastric cases were excluded owing to the high incidence of neurosis in this group. Obvious surgical cases, e.g. those with bandages, splints, etc., were also excluded. Apart from this there was no selection.

(3) 50 out-patients on the attending list of the neuropsychiatric specialist at the barracks.

(4) 98 control ratings. These were simply men detailed by executive officers just as any working party would be chosen.

Intelligence tests were not applied owing to the negative result in the first experiment. As before, roughly equal numbers of neuropsychiatric patients and controls were present at each session, the Wrens being unaware which men were patients and which controls. The first experiment showed that reference on physical grounds is relatively unproductive, and screens off considerable numbers suffering from purely physical ailments, e.g. bronchitis. In the second experiment, therefore, it was decided to consider as positive "mental" references only; physical findings were ignored unless there was some additional evidence pointing to a neurotic element in the disability.

All the forms were scrutinized by us (without knowledge as to whether the case was a neuropsychiatric one or not) and, on the basis of the facts recorded by the Wren regarding school and work record, together with the answers to the stability questions, we classified the forms into two groups: (1) Those which in our judgment indicated that a psychiatric interview was desirable, and (2) those which were purely negative or in which the indications were not strong enough. The results are shown in Table IV:

TABLE IV.

Out-patients and Normal Sailors.	Positive.	Negative.	Percentage positive.
Neuropsychiatric cases	25	25	50
Controls	16	82	16
Hospital Patients.			
Neuropsychiatric cases	60	37	62
Controls	12	65	16

It will be seen that 28 men, either non-psychiatric hospital patients or presumably normal sailors, yielded sufficient positive evidence to indicate the desirability of a psychiatric examination. Once again special interest attaches to this group, because these men had not previously had a psychiatric interview, and might be taken to represent a sample of positive pick-ups amongst the ordinary population, none of whom had so far broken down.

All 12 in-patients were seen and 9 out of the 16 normal sailor controls. (Unfortunately 7 of these latter were missed, as they were no longer available when the scrutiny of the forms had been completed.) It is a striking fact that of the 21 men seen, no fewer than 12 presented at least some evidence of psychiatric abnormality. In certain cases the abnormality was relatively gross and the outlook for the man very poor. In view of the importance of these 12 cases, a summary is presented in Table V.

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TABLE V.—*Summary of Findings in 12 Control Ratings in whose Case Evidence of Instability was Elicited by the P.O. Wrens, this Finding being Confirmed on Psychiatric Examination.*

In-patients.

1. Hospital diagnosis: Inguinal hernia and arteriosclerosis.
   Wren's report: Weak heart since childhood. Bad sleeper. Indigestion. Occasional fits of tiredness. Worries over trifles. Doesn't make friends easily.
   Psychiatric report: Constitutional inferiority with anxiety. Prognosis in R.N. doubtful.
2. Hospital diagnosis: Osteomyelitis.
   Wren's report: Constantly ill during school days with "rheumatic fever." Was partially crippled and could not walk about. Always felt pain in winter in one leg. Found long hours trying and got bad headaches.
   Psychiatric report: Positive finding confirmed. Off work for "nervous debility" six times two or three weeks at a time. Anxious. Moods of depression. Father committed suicide in depression.
3. Hospital diagnosis: Old infantile paralysis.
   Wren's report: Suffered from headaches for 18 months after concussion in 1937. Becomes dizzy at heights.
   Psychiatric report: Positive finding confirmed. Slight post-concussional state and anxiety symptoms since accident.
4. Hospital diagnosis: Urinary investigation.
   Wren's report: Worried because he is backward. Did not make friends easily. Childish fears of "pictures" in the dark (age 25).
   Psychiatric report: Mental defective and constitutionally anxious. Anxiety state since being torpedoed in December, 1942. Reacted with exacerbation of low back pain and frequency when made fit for draft recently.
5. Hospital diagnosis: Muscular rheumatism.
   Wren's report: Very bad work record. Left second job for health reasons. Doctor told him he was heading for bad nervous breakdown. Has always slept badly. "Gastritis" for 12 months after leaving above job. Improved after a year, but was kept by parents without regular jobs for four years, as he was in "failing health."
   Psychiatric report: Constitutional inferiority with hysteria. Prognosis very poor. Has been almost constantly in hospital since joining the Navy 2½ years ago. (Since transferred to psychiatric unit.)
6. Hospital diagnosis: Fibrositis.
   Wren's report: Thirteen jobs and inadequate reasons for leaving them (age 42). Has always been nervous and easily tired.
   Psychiatric report: Hysterical hypochondriasis precipitated by difficulties in adjusting to service life and domestic worries. Of dull intelligence; has always been managed and carried along by more efficient wife. (Since transferred to psychiatric unit.)
7. Hospital diagnosis: Mastoid.
   Wren's report: Suffered from gastritis for about 17 years. Very strict diet in civilian life. Says he never sleeps more than three hours at a stretch. Left all his jobs for health reasons.
   Psychiatric report: A nervous, anxious man about whom I would have been doubtful from his past record, but who, in fact, appears to have done quite well. Would seem a doubtful risk.
8. Hospital diagnosis: Rheumatoid arthritis.
   Wren's report: Naturally bashful. Worries a lot. Says he gets a sinking feeling in the pit of his stomach.
   Psychiatric report: Anxiety state in a chronically anxious man.

Normal Sailor Controls.

Of the 9 out-patients seen, 4 presented evidence of psychiatric abnormality.

1. Wren's report: Gastric attacks at frequent intervals since 1935. Has attended doctor regularly and taken medicine. Worried over job and over sleeplessness at one period.

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Psychiatric report: This man speaks in macabre tones of the insanity and T.B. in his family. He was nervous as a child and enuretic until 9 years. Apprehensive about his service future. Opinion chronic anxiety state. A good pick-up.

2. Wren's report: Has always been tired since the age of 12 (aged 18). After two years in hospital, age 10, did not make friends with other boys.
   Psychiatric report: In the service less than three months, he does not display the normal entrant's desire to be away on draft, but is already showing a pathological aversion. He is nervous of air raids, afraid of heights and terrified of sea service. Opinion: Chronic anxiety state of mild degree. No indication for intervention yet, save of a stimulating kind, but a bad bet.
3. Wren's report: Poor school record. Prolonged sickness after accident (compensation), followed by pain attributed by doctor to nerves.
   Psychiatric report: A constitutionally timid dullard whose nerves sent him to bed during the London blitz. A good pick-up, though will probably make a satisfactory adjustment in his rating (special repair), which is for shore service.
4. Wren's report: Always worried over bad memory and difficulty in learning. This caused breakdown, 1941–2. Under doctor 18 months. Digestion poor. Always a bad sleeper.
   Psychiatric report: A tense, fussy, over-conscientious individual with a history of two brief "breakdowns." Tends to get keyed up and flustered easily. No affective disturbance apparent now.

It was shown in Table IV above that of 97 in-patients, sufficient positive information regarding pre-service career was elicited in 60 to justify reference for a psychiatric opinion. Amongst the 50 out-patients the corresponding number was 25. It would naturally be anticipated that a larger number of in-patients would be predictable.

Table VI shows a broad classification of the neuropsychiatric cases, together with the numbers which were positive and negative in each category:

TABLE VI.

	Positive.	Negative.	Percentage positive.
Neuropsychiatric In-patients.			
Affective	23	10	70
Hysteria	15	3	83
Psychopathy	7	5	58
Schizophrenia	2	2	..
Mental deficiency	2	2	..
Post-concussional	2	2	..
Epilepsy (inc. "observation epilepsy")	9	7	56
Enuresis	..	4	..
Organic mental reaction	..	2	..
	60	37	62
Neuropsychiatric Out-patients.			
Affective	16	20	44
Hysteria	4	1	..
Psychopathy	3	..	..
Post-concussional	1	1	..
Epilepsy (inc. "observation epilepsy")	1	2	..
Enuresis	..	1	..
	25	25	50

It will be observed that, as in the first experiment, hysterics were picked up with notable success. Combining both experiments, 19 out of 24 gave information respecting their pre-service career justifying psychiatric reference. It will also be observed that 36 out of 50 out-patients fall into the affective groups and that less than half have been picked up. This is not surprising, as many were admirable

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men who had given good service, but they had been exposed to severe stress and had developed anxiety states as a result. It would not be expected that such breakdowns would be readily predictable.

Discussion.

Combining the results of the two experiments, and considering the " mental " pick-ups only of the first experiment, out of 200 psychiatric patients the method employed yielded positive findings in 107 (53 per cent.). Out of 231 controls only 35 (15 per cent.) were classified as positive. It must be noted, however, that of the 28 controls picked up as positive who were subsequently examined psychiatrically, no fewer than 15 presented some evidence of appreciable psychiatric abnormality.

It seems fair to conclude, therefore, that the method is relatively efficient; women of intelligence, common sense and tact, after brief instruction only, can elicit information which indicates the desirability of a psychiatric examination in a reasonably high proportion of those subsequently destined to break down; on the other hand, they will not pick up at the same time an unduly high proportion of candidates subsequently found to be psychiatrically negative.

As is shown in the first experiment, it is, not unnaturally, difficult for the interviewer to distinguish genuine physical complaints from those having a neurotic basis. Reference on " physical " grounds is, therefore, relatively unproductive, and it is doubtless best for the initial interviewer not to refer for psychiatric opinion a case with a history of a physical complaint unless there is additional evidence of a neurotic background.

It is true that in these experiments the information was elicited (except in the case of the controls) after the man's breakdown; and although the information referred only to the history prior to entry, it might be contended that this would at recruitment sometimes have been concealed, wilfully or otherwise. This would undoubtedly be true in some instances, but it was only known to have occurred in a handful of the group investigated. The usual story obtained from psychiatric cases seen in the Navy is that they have never been asked questions bearing on such topics by the initial medical board. It may be said of neurotic individuals as a class that they are only too willing to discuss their past experiences if any interest is shown. It is indeed likely that relevant information bearing on instability is more easily elicited by a sympathetic Wren than by a Medical Board; moreover, women seem to have a remarkable capacity for carrying on repetitive work of this kind without becoming irritated or bored.

It is also true that the results obtained in set experiments of this kind might be unduly encouraging owing to the natural desire of the interviewers to do their best; this incentive might well be considerably weaker under routine conditions of work. It is difficult to estimate the importance of this factor, and doubtless the results presented should be regarded as optimal. Nevertheless, we do feel that with well selected examiners, careful supervision and the knowledge that the work they are doing is appreciated and valuable, the results under routine conditions should not fall far short of those set forth in this paper. The Wrens selected for the experiment were not chosen because they were the best interviewers, but were, in fact, considered by the supervisors to be a fair sample. We have compared the results obtained by the four Wrens in the second experiment, and found that the proportion of psychiatric in-patients picked up as positive hardly differed at all, whereas two of the Wrens were definitely superior to the others in picking up the less marked abnormalities displayed by the out-patients. This difference confirmed the forecast made by the supervisors. Given favourable conditions we do not feel that individual differences in the efficiency of screening are as great as might have been anticipated.

Summary.

The screening procedure described comprises a short interview by intelligent women who have received brief instruction only. They assess school and work record and, without using a set form of questions, discuss a selected list of topics bearing on stability. It is found that this method, without rousing resentment, can yield a reasonable proportion of pick-ups for subsequent psychiatric interview, at which it will indeed be found that psychiatric abnormality is frequently present.

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On the other hand, relatively few persons are picked up in whom significant psychiatric abnormality is not present.

In the course of two experiments the procedure was applied to psychiatric in-patients and out-patients, non-psychiatric in-patients and normal sailors serving as controls. Pre-service history only was considered, and the interviewers were not aware which men were psychiatric patients and which controls. The result was as follows:

	Picked up.	Not picked up.	Percentage picked up.
Psychiatric patients	107	93	53
Controls	35	196	15

Of the controls picked up no less than half proved on examination to present appreciable psychiatric abnormality.

Acknowledgments.

We wish to express our great indebtedness to those who carried out the interviewing, P.O. Wrens H. E. Hyman, M. B. Kirk, M. N. Rees, E. G. Ripley, E. M. Scott and M. N. E. Sherwood, and to the supervisors, Miss M. A. Lane and Miss K. M. Lewis. We also wish to thank all those, too numerous to mention individually, whose co-operation made the experiments possible.

APPENDIX 1.

Neuropsychiatric Patients.

The following is a strictly random sample of pre-service positive findings elicited by the Wrens indicating the desirability of a psychiatric examination:

1. Very fidgety at work and worried by long hours; period of past sleeplessness; advised by doctor to change work and rest. (Diagnosis: Affective.)

2. Never had settled job—twelve or more by age 22. Left last one to join up because noise gave him headaches. (Diagnosis: Hysteria.)

3. Police conviction quashed on grounds of mental state a year ago, since when treated by a psychiatrist. (Diagnosis: Psychopathy.)

4. Lifelong fear of tuberculosis—even healthy sport motivated by this. Excitable and also nervous in company. Vague hopes of becoming a missionary, but has taken no steps (? personality determination of prolongation of headaches). (Diagnosis: Post-concussional.)

5. Could never stand the same people round him all the time; got "fed up" and often asked for change of job as a dyer. Fussy about his food. "Worried over the least thing." Always had to reassure himself over trifling activities (light switches, gas, etc.). Broken sleep. (Diagnosis: Affective.)

6. Could not concentrate as had too many people round him when at night school for short period. More nervy in winter than in summer as bad weather always depressed him. Nerves got better during nine months' labouring and ate and slept better after leaving office. Three times "on the verge of a nervous breakdown." Went to doctor for his nerves. Always a bad sleeper. Afraid of insanity since the age of 12, and suffered from feelings of unreality at night and in strange places. Has a horror of going away from home. Could not bear to look up at the stars. (Diagnosis: Affective.)

7. Afraid of the dark as a child and since (aged 22); used to worry terribly over his studies and had nightmares which woke him up. Suffered from very bad headaches after studying or after a long working day. Has always worried very much. (Diagnosis: Affective.)

8. Is aged 20. Had nervous breakdown aged 12½, when working for a scholarship. Fainted six to eight times a week and all school work stopped for six months. Had headaches up to 14 and had to be careful over his food. Was dieted for his blood pressure at 16. Liable to nightmares. Mother said he worried even while at school. Got tired when doing errands. Could not bear enclosed spaces. (Has a good work record.) (Diagnosis: Affective.)

9. Five jobs by the age of 20; left the third after "telling the boss off," and the fourth (a kitchen boy in a mental home) because it was too confined. Whilst in that job had stomach trouble. (Diagnosis: Affective.)

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10. Aged 18; drove milk van for father. Always highly strung and easily excited. Used to go five times a week to the cinema, and if film was too exciting used to tear his clothes where he was. Fractured skull at 16. (Diagnosis: Hysteria.)

11. Joined the army when under age, but purchased his discharge to become a professional boxer. Had a bad concussion boxing and doctor told him to rest for six months. Has never had many fights. Highly strung as a child; could never sleep until 4 a.m. before a fight. Says he only got into top standard at school because his father kept at him with a big cane. Gets easily tired and has little energy except when in gymnasium. Says he has a "terrible" inferiority complex. (Diagnosis: Hysteria.)

12. Aged 42. Was invalided from the army for shell-shock and from the Royal Marines for neurasthenia. Couldn't stick his next job. Joined the Merchant Navy, from which he was also invalided for his nerves. Always unable to concentrate on anything for any time. Was always restless and could never settle anywhere. Was a policeman for year before he joined up. (Diagnosis: Psychopath.)

13. Has not been strong since childhood—very highly strung and nervous (aged 18). Does not sleep very well and his appetite has never been good. Had to avoid rich or heavy foods. Says he suffers from fainting turns. Has felt worse since experience of blitz in Bristol. (Diagnosis: Psychopath.)

14. Head and nerves affected by blast sustained in 1941, since when has been depressed; has slept badly and has had poor appetite. (Diagnosis: Post-concussional.)

15. Poor work record—six jobs by age of 32 and inadequate reasons for changing. Suffers from indigestion. Sometimes cannot sleep and always inclined to worry. Says he is critical and easily irritated. Likes to be on his own and not interested in fellow workmen. (Diagnosis: Observation epilepsy.)

16. Gave up at least one of his six jobs for health reasons. At that time had shocked nerves; started dreaming of falling stones (worked in mine). Couldn't eat and slept badly. Says he took after mother, "a very nervous type." (Diagnosis: Affective.)

17. Always timid as a child and felt inferior to everyone (aged 23). A sleep-walker and has nightmares. Once cut his head whilst walking in his sleep. Never a good sleeper. (Diagnosis: Affective.)

18. Occasional bad headaches brought on by excitement and travel, and worry since fractured skull ten years ago. Worries about his work. Says he has spasms of lassitude often each year. Dislikes crowds. (Diagnosis: Affective.)

19. Hospital from 6 to 11 years old. Stomach ulcers 16 to 30 years. Always poor sleeper; sleep-walker. Health record always worried him. "Always been very nervous." Took outdoor job for health reasons. (Diagnosis: Hysteria.)

20. "Mother says I was highly strung." Volunteered information that he chose Navy because he did not like heights. Afraid of dark as a child. (Diagnosis: Post-concussional.)

APPENDIX 2.

Instructions to Wrens on the Assessment of Stability.

As regards the assessment of work record the relevant passages from the skeleton outline provided were as follows:

"Remember that opportunities for work have been much better since the war. The work record since the war may therefore be misleading, especially in the case of older men. When pressed for time, and again especially in the case of older men, concentrate on the work record in the last five years before the war. Remember, too, that many men change their jobs a good deal in their 'teens before they settle down, and this may give a misleadingly poor impression.

"Look for suspicious points in the work record. Put in general terms, you should be suspicious of any man who has been much unemployed (except in certain areas), who has failed to earn more as he grows older, or who has frequently changed his job. Here, again, the history of the last five years before the war is more illuminating than what goes before.

"The reasons for changing jobs are often indicative of neurotic tendencies, instability or lack of persistence. Be suspicious of any man who frequently changes

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his job for no good reason, or who changed his job because he thought it was bad for his health, or who alleges that a doctor stated this. The same applies to men who have sought 'lighter work,' whether on their own initiative or on (alleged) medical advice. Again, certain neurotic individuals seek outdoor work, not so much because they like outdoor life, but because they believe, or say they were told, that 'the fresh air would be good for them.' Other suspicious reasons are finding noise trying or becoming easily fatigued; and finally, there is a group who cannot stick at a job because of difficulties that repeatedly arise with their fellow workers or with those over them.

"When such suspicious points are elicited, the facts should be recorded, but without comment.

"When eliciting the work record, it may save time (*a*) to find out first of all whether what is given as the 'main occupation' was the one that was held up to the time of call-up, and (*b*) to concentrate on the last five years, especially when confronted with a complicated work record. In such cases the questions, 'How many jobs have you held in the last five years?,' and 'How much time (just roughly in months) have you been off work in the last five years?' will often give valuable information quickly. These questions can in suitable cases be supplemented by such other questions as 'Were you out of work just because of bad luck, or was it because you were not fit?'"

In addition the Wrens were given certain questions or rather topics for special investigation. It was emphasized that information on those topics could often best be elicited when inquiring about the work record or if the occasion arose in other ways, and that inadequate or misleading information would be likely to result from popping a series of bare questions at the end of the interview.

The skeleton outline provided regarding these questions or topics was as follows:

"(*a*) On special interests and hobbies and how spare time is employed, the questions to be asked are 'What are you keen on doing in your spare time?', 'Have you any special hobbies or interests?,' and in certain cases, 'What do you really look forward to doing when you are off work?'

"Unlike the subsequent questions you should always write something down, for the fact that a man does nothing in his spare time and has no special hobbies or interests is as important a fact as that he should be a pillar of his local Y.M.C.A., keep pigeons or play football.

"What is really valuable for stability is evidence of a *sustained* capacity of interest and activity, as is the converse for instability. Remember that the output of physical energy of neurotic individuals tends to be low, and that the majority of neurotics do not relish team games or activities in which they can hurt themselves.

"(*b*) 'For what illnesses have you been off work?' When pressed for time, this again may be supplemented by 'during the last five years.' The essence here is to determine whether the man feels that he has made a complete recovery or not. 'Are you quite fit again now, or do you still have to go slow in any way?' If a man admits he has had a nervous breakdown, this fact should be doubly underlined, and its date, duration and any hospital admission recorded.

"(*c*) 'Has your health been good? Have you had to go to your doctor a certain amount? Or often?' Here, again, the essence is to try to determine whether a man feels he has been handicapped by his health during recent years, or whether he had to restrict his activities in any way because of health reasons. Quite a lot of people visit their doctor rather frequently because they feel 'run down' or 'need a tonic.' This sort of fact if elicited should be recorded if it has occurred at all frequently during recent years.

"(*d*) 'What about your digestion? Do you have to be at all careful in what you eat?' (and if so) 'Do you have to take a special diet or medicine?' Here once more the recent history is the important one. If a man has been on a special diet (or medicine for his indigestion) continuously for over a year up to the time of call-up this should be trebly underlined.

"(*e*) 'How do you sleep? Do you sleep well? Have you always been a good sleeper?' Perhaps the majority of nervous troubles, whether in the present or in the past, are associated with poor sleep. The history of a period of poor sleep in the past should prompt further inquiry as to the associated symptoms.

"(*f*) 'What about your powers of endurance? Do you get easily tired?

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More so than other men ?' Here, again, positive statements should always be supplemented by factual illustrative data.

"(*g*) 'Would you regard yourself as sensitive or highly strung ? Have you ever had any trouble with your nerves ?' The same rule applies. Positive statements must invariably be accompanied by illustrations as to how exactly pleasure and activities were diminished or restricted.

"It may be said with some confidence that *persistently* negative answers to the above questions would suggest some failure in the technique of eliciting the required information. Nor need you be afraid of manufacturing symptoms; for it is only possible to suggest symptoms of the kind you are seeking to the potentially unstable or unsatisfactory."

Any fear that this type of interviewing might be resented would readily have been dispelled by seeing the Wrens at work. The interviews were, in fact, accepted without question; many thousands of men have been seen, and only a negligible number of complaints have been received.

(*P.S.*—The "sleep" questions produced some ribald replies—principally in Glasgow.)

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STATES OF HEIGHTENED SUGGESTIBILITY: NARCOSIS.

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(1) *Introduction.*—The present paper reports the results of certain experiments carried out in an attempt to obtain information on the increase in suggestibility which is often said to follow the administration of certain narcotics, in particular sodium amytal and nitrous oxide. The set-up of the experiment, and the results and conclusions reached, may be looked at from two different points of view, viz., (1) with regard to the light that is thrown on the action of the narcotics examined, and (2) with regard to the nature of suggestibility.

The existence of a close correlation between narcosis and heightened suggestibility has been asserted by many writers. Starkey (19) in 1917 found light ether hypnosis valuable in producing relaxation and increased suggestibility; later workers disliked the variability and uncertainty of this and similar methods and turned to the "short-acting" barbiturates. Hauptmann (9) used evipan intravenously in the production of hypnosis, while Horsley (10) preferred pentothal and nembutal. He found that a state of optimum suggestibility could be induced by small doses of these drugs. Stungo (20) used a 10 per cent. solution of evipan intravenously in subanaesthetic doses and found that a heightened state of suggestibility was induced, and a kind of artificial hypnosis could be obtained, in patients otherwise recalcitrant. Dicks (2) reported on the euphoric-suggestible state of patients injected with evipan and pentothal, and considered this state very suitable for psychological treatment. Rogerson (18) used both intravenous barbiturate injections and nitrous oxide inhalation, and found an increase in suggestibility after administration of either narcotic.

The statement that a certain drug increases the suggestibility of the person to whom it is administered lacks proper scientific connotation unless we can define the concept "suggestibility" operationally, and measure the changes which occur consequent upon the administration of the drug. A concept like suggestibility, which belongs to popular rather than to scientific psychology, may cover a multitude of phenomena explicable in terms of diverse mental functions. Simple clinical impression cannot take the place of controlled measurement and experimentation.

Such tests of suggestibility as have been used in psychological work fall clearly into several distinct groups. Allocation of the tests to each group is on the basis of their correlation with other tests in that group; the underlying principle which gives meaning to these groupings can be determined by an examination of the features characterizing all the tests in any one group. Two main types of suggestibility have been delimited hitherto by means of factorial studies, and a third type has been shown to possess a certain amount of functional unity. In the first instance we have what has been called Primary Suggestibility, or suggestibility of the ideo-motor kind (3, 4). The type of test most clearly representative of primary suggestibility is the so-called body-sway test (11), in which the subject stands upright, with his eyes closed, while a gramophone record repeats the suggestion: "You are falling—you are falling forward—you are falling forward now" over and over agin. The amount of body sway induced by the suggestion, in spite of the subject's desire to remain in the upright position, constitutes his suggestibility score.

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Other tests of primary suggestibility are similar in nature: the arm levitation test is based on the movement of the subject's arm, held sideways, either up or down in accordance with the suggestion; the press-release test, described in detail below, is based on the pressing or releasing movement of the subject's hand, in accordance with suggestion; the Chevreul Pendulum test is based on the swinging of a pendulum held by the subject, in accordance with suggestion; and so on and so forth. Of particular interest in this connection is the fact that these tests of primary suggestibility correlate very highly with tests of hypnotizability and post-hypnotic suggestibility; by the use of a suitable battery of tests it has been found possible to predict a subject's hypnotizability with almost complete accuracy (6).

Another interesting point is that primary suggestibility is highly correlated with neuroticism; in a recent report, a correlation of 0·66 was found between neurosis and suggestibility when 110 normal and 110 neurotic men and women were tested by means of the body-sway test (5). Also, contrary to the common view, as voiced by Janet, Babinski, and many modern psychiatrists, hysterics are no more susceptible to primary suggestibility than are other types of neurotics (3). Both the positive correlation between neuroticism and suggestibility, and the lack of correlation between hysteria and suggestibility, have since been confirmed by extensive studies mainly at this hospital, involving altogether some 1,400 subjects, both normal and neurotic.

Tests of secondary suggestibility, or gullibility as it might very well be called, depend largely on indirection. In the Heat Illusion Test, for instance, the patient is told to note the moment a handle he is asked to hold gets hot; three times running the handle is heated by an electric current; the fourth time the current is switched off without the patient's knowledge, and yet a suggestible subject will again feel the heat. Or odoriferous bottles may be presented, mixed with bottles containing water; suggestible subjects will identify the odour of the bottles containing only water. Suggestible subjects will see certain shapes which are suggested to them in inkblots, or report from memory the presence of certain objects in pictures because their presence was implied in the question put by the examiner. Tests of this kind correlate negatively with intelligence, and show much less functional unity than do tests of primary suggestibility. There is no correlation whatever between primary and secondary suggestibility (3, 6).

Prestige suggestibility may form a tertiary kind of suggestibility (7), but the possibility that such tests as are used to define it may correlate with tests of secondary suggestibility has not been ruled out. In consequence, the existence of this kind of suggestibility must be left open, as well as the existence of still other "suggestibilities."

In the present paper we have used tests of primary suggestibility. This choice was conditioned largely by the fact that the action of the barbiturates and other narcotic drugs is often likened to hypnosis; indeed, the term "hypnotic drugs" has become quite general in recent years. In view of the close affinity between hypnosis and primary suggestibility our choice appears almost inevitable. We do not mean to deny the possibility, of course, that the indefinite statement that "hypnotic drugs increase suggestibility" may refer to secondary suggestibility, or to any other kind; experimentation along these lines would be of great interest and value.

(2) *The experiment.*—The set-up of our experiment was partly determined by certain experimental inadequacies of the only empirical study carried out in the field of suggestibility and drug-administration. Baernstein (1) tested 19 college students by means of the body sway test, under two conditions: (1) after injection of ½ c.c. of sterile water (control experiment), and (2) after injection of one U.S.P. tablet containing $\frac{1}{100}$ gr. of scopolamine hydrobromide dissolved in ½ c.c. of sterile water. Under these conditions she found a considerable increase in suggestibility in eight of her subjects from state (1) to state (2); she also found, however, that eleven subjects who in the control experiment had not swayed at all did not sway either after injection of the drug.

The main objection to this experiment derives from the fact that the drug injected might have increased, not the suggestibility of the subjects, but their static ataxia. The experiment does not include a vital control test, viz., a test of their ability to stand after the administration of the drug without any suggestion

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at all. If this ability is impaired by the drug, as seems possible, the experiment would prove nothing regarding increased suggestibility under narcosis, but would merely show a selective increase in static ataxia. This criticism is strengthened by the fact that on samples of 60 male and 60 female neurotics we found correlations of 0·6 and upwards between static ataxia and body-sway suggestibility. Clearly, then, this factor of non-suggestion body-sway must be ruled out before we can admit the conclusions as valid.

An attempt was made to do this by means of the following experimental procedure: Two groups of neurotic patients were selected on the basis of their body-sway scores; group A was made up of ten patients who were not in the least suggestible, swaying less than 1 in. during the suggestion period, while group B was made up of ten patients who were markedly suggestible, swaying 3 in. or more during the suggestion period. All twenty patients were then tested on the Press-Release test, which was specially designed for the purpose of this experiment, and their scores recorded. They were then injected with sodium amytal (or made to inhale nitrous oxide, as in our second experiment), and retested on the Press-Release test. Changes in suggestibility scores on the Press-Release test indicated increase in suggestibility due to the injection, or the inhalation, of the narcotic. A special control experiment was performed to safeguard against the influence of the suggestive effects of the procedure of injecting the patient.

The Press-Release test was designed in order to obviate the criticisms of Baernstein's experiment stated above. In this test the patient lies on a bed, with his eyes closed, and holds a rubber ball or bulb in his preferred hand. This bulb is connected through a rubber tube to a tambour. Pressure on the bulb increases the volume of air in the tambour, thus stretching the rubber membrane covering the latter; this movement in turn activates an ink-writer which produces a tracing on a kymograph. Thus we obtain an accurate record of the exact amount of pressure exerted at any one moment of time on the rubber bulb in the subject's hand.

The subject is told that he is required to exert a certain steady amount of pressure on the bulb; an increase in pressure in indicated by a rise in the curve on the kymograph record, while a decrease is indicated by a fall in the curve. He is then told to keep on holding the bulb exactly like this while a gramophone record is played to him. He is to listen carefully, but to keep on holding the bulb exactly the way he is holding it now. Then the gramophone record is started, which goes on for one minute repeating the suggestion: "You are squeezing the bulb—you are squeezing the bulb—you are squeezing it harder, harder—you are squeezing the bulb . . ." (A gramophone record was used in preference to using personal suggestion because it would appear to rule out the subjective element in the giving of the suggestion more successfully. A comparison of the effects of personal and recorded suggestion is given elsewhere (4).)

The Press-Release test has been shown to measure primary suggestibility by correlating scores obtained from 60 subjects on this test with scores made by the same subjects on eleven other tests of suggestibility, including tests of hypnotizability and post-hypnotic suggestibility (6). It thus measures essentially the same function as does the body-sway test, without being subject to the objection that static ataxia might in any way interfere with the testing. The patients seemed to find little difficulty in doing this test even when in the narcotic state, whereas they would certainly not have been in a position to do the body-sway test.

(3) *Results.*—Fig. 1 shows the records of the Press-Release test of ten suggestible patients in the normal state and after sodium amytal injection. In conjunction with each double record are shown the patient's sex, and the amount of narcotic injected. (10 per cent. sodium amytal solution was injected intravenously at the rate of 1 c.c. per minute. The patient was requested to count backwards from 50, and when the counting became confused, as shown by omitting or repeating numbers, or counting in normal progression, the injection was stopped. While the patient's weight and other factors probably influence the amount of sodium amytal required to produce this state of narcosis, it has been found impossible to predict the exact dosage required beforehand (14), and our rather subjective method appeared the only one practicable in order to obtain comparable depth of narcosis.)

It will be seen that in every case there is a marked increase in suggestibility,

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as shown by the fact that the curve (1) begins earlier, (2) rises more steeply, (3) reaches a greater height, or (4) continues longer in the narcotic than it does in the

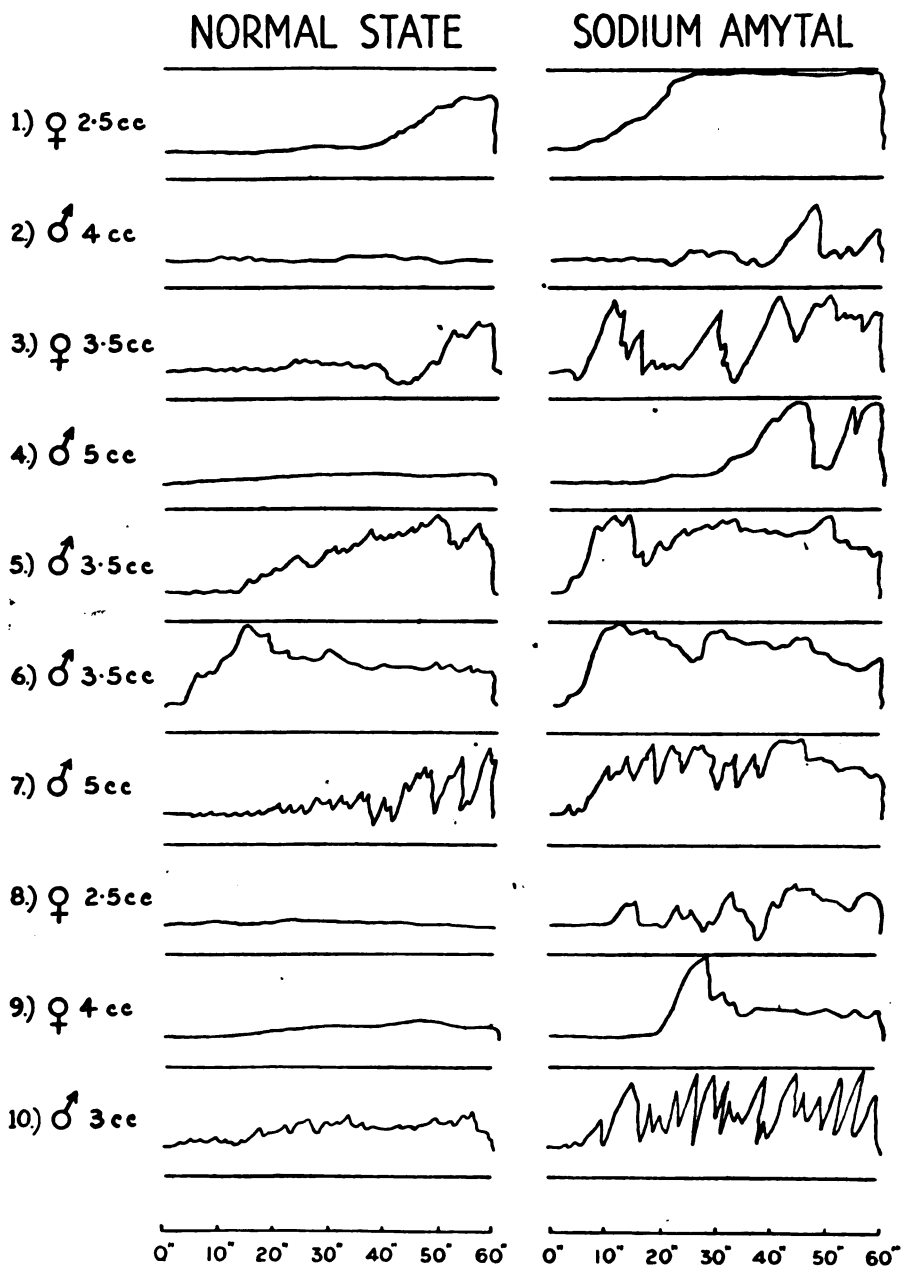

FIG. 1.

normal state. The probability that this increase consequent upon the injection of the drug is a significant phenomenon, and not due to chance, is a thousand to one (P = ·001).

Quite a different picture is given by the records of the non-suggestible patients.

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In no case is there an increase in suggestibility in the second record; in some cases the only effect is a slight *relaxation* of pressure. In the majority of cases no

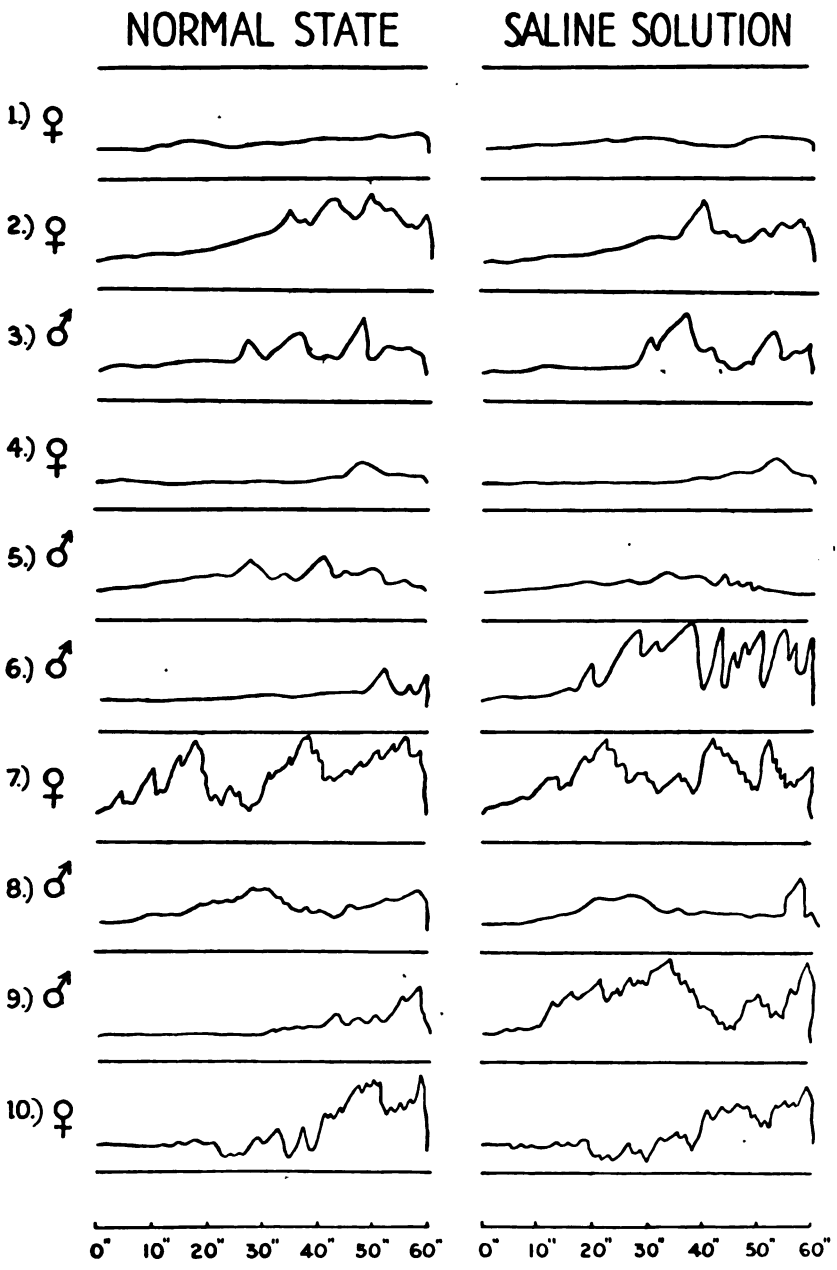

FIG. 2.

difference whatever is observed between the original record and the record obtained during narcosis. The average amount of sodium amytal injected was identical for the two groups.

It is reasonable to conclude that *suggestible subjects are made more suggestible by*

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sodium amytal injection, while non-suggestible subjects remain completely unaffected by the drug. The possibility of achieving such complete concordance in the experi-

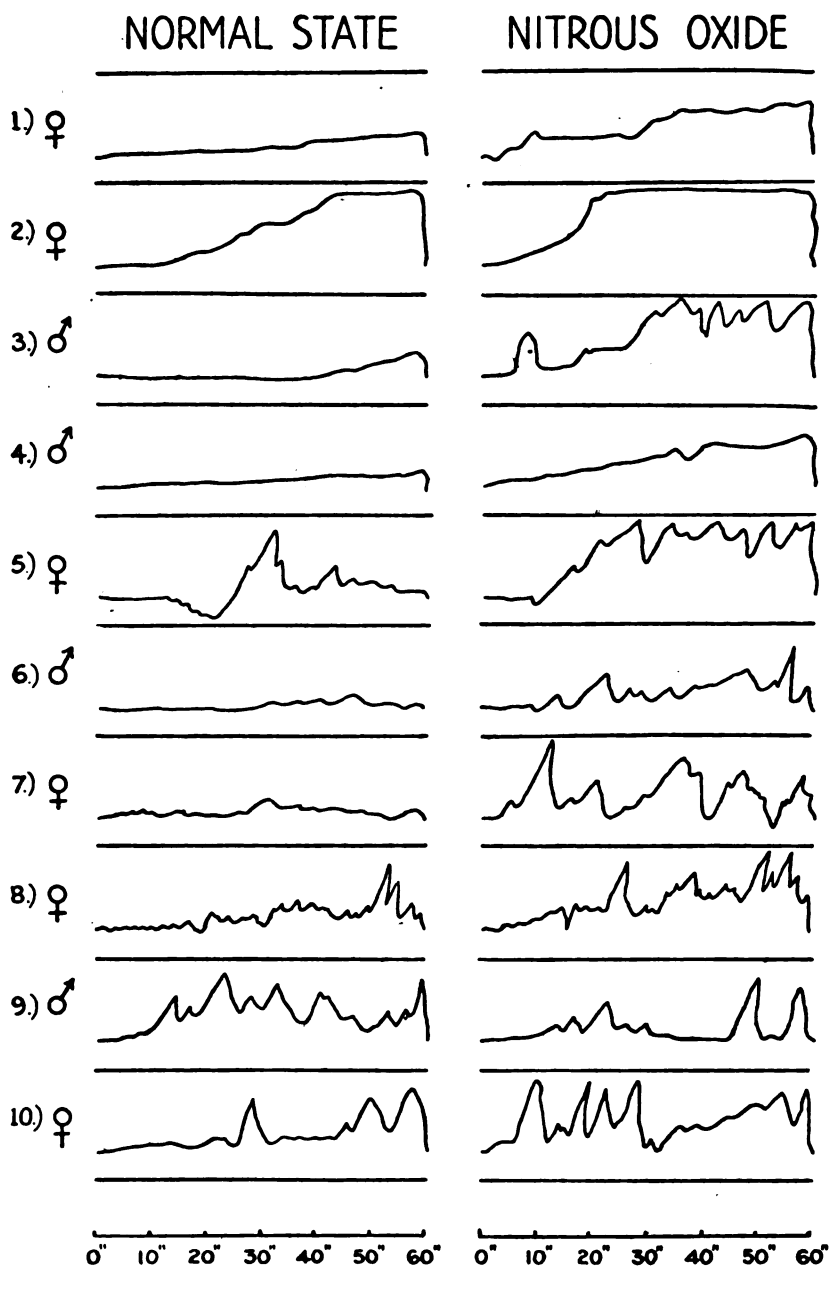

FIG. 3.

mental results by chance is less than one in a million (P = ·000001), and we may therefore consider the above conclusion amply justified on statistical grounds.

The obvious explanation of the results obtained would ascribe the observed increase in suggestibility to the direct action of the drug. Two alternative explana-

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tions, however, must be considered. The first of these is that *practice effects* might be responsible for the increase in suggestibility of the suggestible group during the second test. The second possibility is that the *suggestive effect* of the whole procedure of injection and retesting might be responsible for the increase. The two hypotheses just mentioned can both be tested by injecting ten suggestible subjects with saline solution, and retesting them in exactly the same manner in which the subjects injected with sodium amytal were retested. The results of this experiment are shown in Fig. 2. In eight cases there is no increase on retesting; in two cases (Nos. 6 and 9) there is a marked increase after injection with saline solution. These results show that while in isolated cases practice effects and/or indirect suggestion effects may be responsible for increases in the suggestibility of suggestible subjects, this effect is very much weaker on the whole than is the effect of sodium amytal.

In Fig. 3 are shown the results of testing ten suggestible subjects before and after the inhalation of nitrous oxide.* The gas was self-administered, and administration was automatically stopped when the pressure of the patient's hand on the mask was relaxed following onset of narcosis. It will be seen that in nine cases out of ten there is a marked increase in suggestibility following the administration of the gas; in the case of No. 9 there is a lessening in suggestibility. A group of ten non-suggestible patients shows exactly the same picture as did the comparable cases in the previous experiment; in a few instances there is a slight *relaxation* of pressure, but in the majority of cases there is no change at all. These results are statistically significant beyond any possible doubt. Thus this experiment results in a conclusion very similar to that given above: *Suggestible subjects are made more suggestible by nitrous oxide inhalation, while non-suggestible subjects remain completely unaffected by the gas.*

(4) *Discussion.*—The results of our experiments, then, are more definite than is usual in psychological work; their interpretation, however, presents certain difficulties. No definite explanation, in fact, can be given until far more is known both about the action of narcotic drugs and gases on the central nervous system, and about the nature of suggestibility. In these circumstances we can only present an heuristic theory which, while not strictly speaking enforced by the data, is yet capable of accounting for them satisfactorily, and which, furthermore, is open to confirmation or disproof by further experimentation.

In earlier work it has been shown that primary suggestibility is determined by two main factors, called *aptitude* and *attitude* (3, 4). Aptitude is conceived of as a neuro-muscular tendency for the idea of a movement to be followed by an incipient form of that movement (ideo-motor tendency); that such a tendency does definitely exist in the majority of normal subjects, if not in all, is shown by the work of Jacobson (12,13), Max (16) and others, who recorded the action-currents in the muscles whose movement the subject was asked to imagine. They also showed that this tendency existed to varying extent in the people tested, some persons showing strong reactions, others very weak reactions. Introspective evidence from normal and neurotic subjects who were given the body-sway test shows that their "susceptibility" to the suggestion is equally varied; some subjects are quite unaffected by the suggestion, while others feel an irresistible pull forward.

Superimposed on this aptitude is the attitude of the subject. This concept covers the willingness or unwillingness of the subject to carry out the suggestion, and his ability to overcome such ideo-motor tendencies as may be present. In our experiments we tried to insure that the subjects should have a maximum negative attitude to the suggestion, i.e., that they should try as hard as they could to overcome the suggestion. That this attempt was relatively successful is shown by the fact that many subjects gave visible signs of their resistance to the suggestion, shaking their heads vigorously, clenching their teeth, and even saying "No, no" quite audibly. We may conclude, then, that we have more or less eliminated individual differences in approach to the test procedure, so that what remains is the *ability of the subjects to overcome the ideo-motor tendencies aroused by the record through an effort of their will.* Results of testing neurotics and normals indicate that this effort of the will is far less successful in the case of neurotic subjects than in the case of normals; this is not surprising if we regard the "will" simply as an expression of the integrated personality (8, 17). Clearly, on the average, neurotics

* Proportion of gas to air = 45%. The apparatus was similar to Minnitt's obstetrical gas-air-analgesia apparatus.

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show much less integration than do normal subjects; indeed, this statement may almost be said to be tautological.

In selecting our two groups of patients, we chose one group on the basis of their lack of suggestibility, i.e., presumably on the basis of their comparative lack of ideo-motor tendencies. It might be said that possibly this group consisted of subjects of great will-power, who were able to overcome strong ideo-motor tendencies. This interpretation does not seem likely to us; the patients selected reported introspectively that they felt little or no tendency to react to the suggestion, and did not exert any great effort in resisting it. Our other group, i.e., the suggestible patients, presumably showed both high ideo-motor activity and low will-power; again, their instrospections bear out this view.

We may reasonably suppose that the administration of sodium amytal or nitrous oxide leads to a lessening of conscious control; indeed, this effect would seem to be the most obvious reaction induced by these narcotics. Using the terms introduced in our discussion above, we should then expect that the narcotic would lead to a lessening of will-power in the subject to whom it was administered. This would lead to certain predictable consequences in the case of the two groups tested. Clearly it would leave the non-suggestible group relatively unaffected. In their case there is no ideo-motor tendency which needs to be kept in check by a controlling mechanism; consequently the partial immobilization of this controlling mechanism would not affect the result of the experiment. Quite differently in the case of the suggestible subject; here a strong ideo-motor tendency is only partially kept in check by the controlling mechanism; once this mechanism is weakened the ideo-motor tendencies emerge more strongly than ever. Thus the consequences of our theory are exactly in line with the results actually obtained in the experiment.

The theory presented here in brief was expounded at greater length elsewhere before the present experiment was concluded; indeed, this experiment was set up partially with a view to obtaining evidence on the value of the theory (6). It should be noted also that there is a certain amount of corroborative experimental evidence in favour of the theory here presented; we might point, for instance, to the well-known work of Luria (15) on motor manifestations in emotional states, which led him to postulate a "functional barrier" very similar in nature to our concept of "will-power."

The clinical usefulness of our findings cannot be determined without a special experiment directed to that end. It is well known, for instance, that some patients fail to respond to therapeutical suggestions made by the psychiatrist while they are in the narcotic state (14), and it seems possible that in these cases we are dealing with patients who are non-suggestible in the normal state. If this were so, the physician could save himself much unnecessary work by having a test like the body-sway test given routinely to all incoming patients; the results of this test then would assist in determining the advisability of hypnotic or narcotic methods of treatment depending for their success on suggestion. The relevance of this possibility to actual clinical work would, of course, depend on the complex question of the kind of suggestibility used in the clinical situation; the physician may rely mainly on prestige rather than on primary suggestibility, for instance, or he may use a combination of different types of suggestibility. Experimental work along these lines would seem to offer fascinating prospects, both for theoretical advance and for practical use.

(5) *Summary and conclusions.*—Ten neurotic patients who had been shown to be non-suggestible on the body-sway test, and ten neurotic patients who had been shown to be suggestible on this test, were given the Press-Release test of Primary Suggestibility (*a*) in the normal state, and (*b*) after intravenous injection of sodium amytal. Two further groups of ten suggestible and ten non-suggestible patients were given the Press-Release test (*a*) in the normal state, and (*b*) after inhalation of nitrous oxide. Another group of ten suggestible patients was given the Press-Release test (*a*) in the normal state, and (*b*) after intravenous injection of saline solution. Comparison of the scores on the test of patients before and after the administration of the narcotic led to the following conclusions:

1. Suggestible patients become more suggestible after injection of sodium amytal in subanaesthetic doses.

2. Suggestible patients become more suggestible after inhalation of nitrous oxide in subanaesthetic doses.

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3. Non-suggestible patients remain non-suggestible after the administration of these two narcotics.

4. A small part of the increase in suggestibility consequent upon the administration of the narcotics is due to practice effects and/or the suggestive effects of the procedure of administration.

5. These results may be of clinical importance in explaining the failures occasionally experienced with narco-analysis, and suggest the advisability of using routine suggestibility tests as aids in decisions regarding treatment by suggestion methods.

6. These results support an heuristic theory of suggestibility which emphasizes the importance of the two factors of (1) *aptitude* or ideo-motor tendency, and (2) *attitude* or conscious control.

We wish to thank Dr. W. S. Maclay, Medical Superintendent of Mill Hill Emergency Hospital, for permission to test the patients.

APPENDIX: *Illustrative Case History.*

The theory developed in the preceding pages would appear to be applicable not only to the limited field of experimental psychology, but also to an understanding of certain abnormal modes of behaviour. The case history given below may therefore be of interest in suggesting certain applications of our findings which may be of some value psychiatrically, although to date such application would be based on reasoning by analogy, rather than on strict scientific proof.

The case discussed is that of a young woman, in her early twenties, suffering from psychopathic personality with antisocial trends. She was referred to the hospital on account of attacks of depression and uncontrollable impulses. Her mother committed suicide, and a brother had a nervous illness, probably schizophrenia. She has always been emotionally unstable, irritable, and intolerant. From an early age her behaviour tended to be impulsive, and this tendency has become more marked in the last eighteen months, manifesting itself in stealing, excessive drinking, sexual indulgence, and aggressive outbursts. She had impulses to get out of enclosed spaces, jump out of windows, go off on train journeys, enter stationary vehicles, and spend all her money. About a year before admission she attempted to commit suicide. Electro-encephalogram was markedly abnormal.

Her experimental record on the Press-Release test is shown in Fig. 3, No. 8. (She had fallen outright when given the body-sway test.) It will be seen that in the normal state she squeezed the bulb from the very beginning of the suggestion, squeezing and relaxing at regular intervals. After 20 seconds her squeezes became stronger, though still showing the alternation with short periods of relaxation. Towards the end there were two very strong, almost convulsive squeezes. After nitrous oxide inhalation it will be seen that the same main features are preserved in the record, except that this time the rise in the curve comes earlier, and that the convulsive squeeze at the end is even harder than before—in fact, she almost burst the rubber diaphragm, and the bulb had to be taken from her, as she clung to it even after the suggestion had ceased. The interplay between ideo-motor tendency and conscious control is quite obvious in the record, and the patient herself drew attention to the similarity between suggestion in the experimental situation and the impulses which she found it so difficult to govern in her life.

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OBSERVATIONS IN HYPOGLYCAEMIA: V. DISORDERS OF SPEECH.

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DURING the hypoglycaemia produced by insulin for the treatment of psychoses, disorders of speech occur as symptoms of the dissolution and restitution of cerebral function. Although transitory, they can be observed accurately, as the hypoglycaemic condition is repeated daily for weeks in the same patient. They have in fact been studied and commented on by several workers since the method was initiated by Sakel in 1934; we shall refer later to some of the findings and views in the literature. In this paper an attempt will be made to describe and classify the various speech disorders, and to relate their characteristic features to other hypoglycaemic symptoms occurring at the same time. Attention will be drawn to certain speech-like symptoms which hitherto have been scarcely noticed. The possible influence of the underlying psychosis will also have to be considered.

Like the motor phenomena in hypoglycaemia, the nature and duration of speech anomalies vary a good deal from patient to patient, but the individual patient has his pattern of symptoms, which is reproduced in every detail in each treatment.

1. LOSS OF SPEECH AND ISOLATED DYSPHASIAS.

In some cases no abnormal speech or sound is produced during the whole hypoglycaemic condition. The patients quietly lapse from sleep into deep coma, the transitional period being relatively short. On waking up, consciousness is regained quite quickly and the patient seems in full control of his speech.

In a second group, speech function is dissociated from consciousness. Motor speech seems earlier affected by hypoglycaemia, and returns later to normal function than both consciousness and other motor behaviour. The patient appears dumb at a time when his eye movements still follow the observer; while he can carry out on request movements of his limbs, face and even tongue, he is, he reports afterwards, unable to speak. Occasionally we saw this speechlessness remain for some time after all other signs of hypoglycaemia had disappeared. That the patient was fully conscious is proved by his clear recollection of this condition. If speechlessness occurred in a setting of general immobility, it was probably part of the syndrome of "akinetic mutism" discussed by one of us in a former paper (Mayer-Gross, 1943), and related to a subcortical mechanism. To differentiate clinically this picture from catatonic mutism often seemed impossible. As most of our patients were schizophrenics a predisposition to catatonic reactions related to the underlying illness could not be excluded, but it was also observed in cases that never showed catatonic features in their psychosis either before or afterwards.

That remaining speechlessness can be of the nature of a motor aphasia of cortical origin was proved in one of our cases, a Norwegian, who remained mute after waking up from coma. He got out of bed, dressed himself, moved about freely and understood what was said to him. After half an hour he began to answer in Norwegian, seemingly unaware that nobody could understand him. Only after another hour did he regain his control of English, which he ordinarily spoke very well. In one of a group of Polish soldiers treated together a similar observation was even more characteristic and better understood—thanks to the help of his compatriots. During the stage of waking from coma the patient began to shout and sing in Polish, repeating the same phrases and swear words, some of them uttered in a distorted paraphasic form. He then spoke to the nurses in his mother

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tongue as though expecting to be understood. He did not make use of his small vocabulary of English for some time. Both cases thus demonstrated the earlier recovery of the mother tongue in bilingual aphasics. One might speculate whether the same mechanism was operating when incoherent schizophrenic language reappeared during the awakening of those patients in whom it had formed part of the original psychotic picture. When they were entirely awake the " word salad " disappeared. It was a transient revival of psychotic symptoms similar to the return of hallucinations or paranoid episodes so frequently observed in the post-comatose stage.

Periods of auditory (sensory) aphasia are much more difficult to verify, since the clouding of consciousness prevailing in hypoglycaemia interferes with perception in general. Many self-descriptions are suggestive of a suspension of speech perception at a time when consciousness is apparently restored and sounds are clearly perceived. One of Sakel's patients describes a condition reminiscent of word-deafness: " I saw you perfectly clearly and heard you talk and recognized your voice, but it was impossible for me to understand what you wanted of me or what you were asking for . . . later, even though I understood you, I could not find words to answer your questions sensibly. Then I realized that I was not telling you the things I wanted to say . . . "

Jargon paraphasia, as seen in sensory aphasics with a permanent cerebral lesion, seems to be rare in hypoglycaemia. The majority of paraphasic productions were similar to those in normal dreams, and therefore were probably part of the disorders due to clouding of consciousness.

2. Speech Disorders Accompanying Disturbances of Consciousness.

(a) *Dysarthria and Kindred Symptoms.*

Speech anomalies coincident with and dependent upon clouding of consciousness are much more common than disorders outlasting the general hypoglycaemic condition. If they are not manifest in spontaneous utterances by the patient, they can be easily elicited. This is more easily done during the waking stage than when the patient is going into coma. During the latter, if the patient answers at all, he seems to control his speech relatively well. Speech definitely lags behind, and is slow in recovering during the much shorter stage of awakening. The main symptoms are those seen in other states of reduced clearness of consciousness, dysarthria, slurring, paraphasic condensation of words, clang associations, iteration and echolalia.

Dysarthria is the most common. If one addresses the patient at the right moment he answers with the faulty articulation of the so-called bulbar type, slurring and omitting consonants and syllables. Many patients also perseverate, repeating the same word or phrase whatever the question. The similarity of the behaviour with that in alcoholic intoxication is often striking because of the accompanying elated mood. Like the drunkard, some patients seem to get playful enjoyment from the testing of their disability. Spontaneous speech in this stage is of the same type.

In cases of relatively quick recovery, e.g. after intravenous administration of glucose, echolalia is a very frequent symptom. For about five minutes the patient seems forced to imitate every word and sound in the room without dysarthria or other distortion, but also without proper apperception and understanding—as far as can be judged from his imitation of foreign words. The moment he is fully conscious the symptom disappears without an intermediary stage of dysarthria or perseveration. From its observation in hypoglycaemia its mechanism seems to differ somewhat from that of the other speech disturbances mentioned above. Perhaps it is produced at another level of lowered consciousness.

If proof were needed that the speech disorders described in the last paragraphs are in fact produced by a general reduction of cortical function or, in psychological terms, by clouding of consciousness, it would be provided by identical observations in clouded states of various origin—epilepsy, head injury, and drug intoxications of many kinds. Hemphill (1940) for instance has noted them after convulsions induced for therapeutic purposes. Detailed studies by Bonhoeffer (1898), Symonds (1937), Stengel (1937) and others have shown that apperceptive and cognitive functions including thinking are reduced parallel with speech to a lower level. To

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illustrate this with an example in hypoglycaemia: A patient questioned in the waking stage takes in one word, e.g. " sister," and repeats for a few minutes " good sister " without grasping the whole question. Then he grasps another detail of the situation, say the blue sky seen through the window, and now perseverates the words " lovely day." All mental processes seem equally restricted, the lack of verbal expression corresponding to the narrowing of the perceptive and cognitive field. If pressure of speech is present, scarcity of thought produces reiteration; the same effect may be due to a desire to say something he cannot formulate in words. In short, it is often very difficult for the observer to decide to what extent the patient's failure in language is caused by disorder of speech, of cognition or of thinking.

The character of the disturbance caused by clouding of consciousness is well illustrated in the following verbal report of the waking-up behaviour of one of our patients, a former fighter pilot. The fragmentary emotional reactions in this condition are also shown:

Patient sits up in bed shedding tears. " I never cry—I never cry—I just had some incendiary—incendiary." Doctor touches his legs in sitting down on the bed. " Am I disturbing you?—I just put my feet behind there—I just crashed behind there—there is a fellow over there, pardon me, sergeant, fly through that window, straight through the glass, sergeant, surgeon, drudgeon—good morning, sister." Smiles at nurse and begins to sing. " It doesn't matter, my God—quite, quite, bite, bit, bit, bit—listen, listen, I am delected—" (delighted?). " Why should I be delighted? Doctor, director, what for? Why doctor, doctor!" (please, wake up!). " Sir, how many letters are in that?—in that letter—Oh God, you should be sorry for me. I am very sorry for you because I am inspirational for you—do I say, see, say—I say things—I want things—a drink, a drunk—well let's have some fun." A few minutes later the patient was completely awake, clear and controlled, and gave rational answers.

The speech disorders connected with the dimming of consciousness in hypoglycaemia showed no relation to the underlying illness of our patients. They were mostly suffering from schizophrenia, a disease in which disturbances of consciousness are rare. Semistuporous catatonics, however, sometimes show echolalia. There was no instance of echolalia being a symptom of the psychosis among the many patients who had echolalia when hypoglycaemic.

(b) *Articulate Ejaculations Associated with Myoclonisms.*

More specific for hypoglycaemia and closely connected with its other motor symptoms are certain automatic speech phenomena. They are found only in the hyperkinetic stage, but it should be pointed out that hyperkinesis in hypoglycaemia is not always associated with production of speech and sounds. Two main groups of movements stand out among the varied motor symptoms: the so-called myoclonisms and the movements of the " extrapyramidal," choreo-athetotic type. Myoclonic twitchings are short rhythmic jerks of limbs or of the whole body. They are obviously of cortical origin, being identical with the motor reactions observed when certain parts of the cortex are stimulated by the electric current during an operation. Beginning in the arms, sometimes in the face, the " march of spasms " spreads over all the extremities until the whole patient is shaken by regular jerks. One side of the body may be affected first, so that for instance only the right facial muscles and the right arm may twitch at the start. The movements may continue for a considerable time; but more frequently an interval of rest lasting a few minutes is followed by another wave of twitches, and so on. The symptom is reminiscent of what has been described as epilepsia partialis continua (Kojevnikov, 1895). Myoclonic twitchings are often the forerunners of a generalized epileptiform fit.

The movements are frequently accompanied by verbal ejaculations of an articulate character. Speech and jerks are produced in the same rhythm, the words becoming louder with the increasing myoclonisms, both apparently the result of the same cortical discharge. As a rule the ejaculations appear independent of the anatomical distribution of the twitchings, but on a few occasions we observed them together with twitchings of the right face and right arm only. Many times the articulations, increasing in strength with the myoclonic movements, culminated in a scream which marked the beginning of an epileptiform seizure.

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There was a great variety of words and phrases associated with myoclonism, most of them being of the nature of the "emotional language" of H. Jackson. Exclamations like "My God," "Oh God," "Christ," "Hell," "Oh shucks," "damn" and all the obscene swearwords were common; also "yes—yes—," "no—no—"; and short phrases like "I love you," "good work," etc. One patient regularly repeated the word "white" as soon as he started twitching, another the word "dial," both being unable to account for it when questioned afterwards. The reason for the choice of word or phrase in the special case remained obscure, as did the reason why speech production was present in one patient and absent in another though both showed the same motor phenomena. It was never observed that a word heard or spoken by the patient in the initial stage of twitching was picked up and reiterated. In each case the same word or phrase reappeared every day signalling the myoclonic stage of the patient's hypoglycaemic condition.

If there were no culmination in an epileptiform fit, myoclonic twitchings and ejaculations either disappeared with deepening of the coma, or with the patient awakening through the adreno-sympathetic counteraction caused by muscular exertion. In the latter case he quickly regained his normal speech. During this lucid interval we tried repeatedly to get information regarding his experience, ideas or feelings in the stage of twitching and verbal ejaculations, but with no result. Although some patients seemed uneasy or even embarrassed when questioned about it, they neither remembered what they had uttered nor what they had experienced at the time.

(c) *Primitive Utterances Associated with Choreo-athetotic Movements.*

Movements of the choreo-athetotic group, including torsion movements, are very common in the precomatose stage of hypoglycaemia. They closely resemble the hyperkinetic symptoms in lesions of the basal ganglia. The accompanying utterances are of a much more primitive character than those related to myoclonic twitchings. As they are entirely inarticulate it is doubtful whether they can be described as speech; but they must attract our attention as precursors of speech development because of their similarity to the phonations of the infant in its first year. Some could be described simply as sighing, moaning or groaning, while in other cases their resemblance to the babbling, cooing and gurgling noises of the baby was most striking. They consisted of the typical inarticulate lallation, like ba-ba- or la-la, or in the vowel "ah" only, sounded in regularly varying pitch. Equally frequent were cries and yells, also best described by comparison with the cries of the hungry suckling. These sounds had not the rhythmic jerky character of the articulate words associated with myoclonisms even when they were repeated. The picture of regression was in many instances completed by rocking movements of the head and body, by kicking, pushing, and throwing about of the arms and legs characteristic of the corresponding early stage of life. Here, however, it was seen in a grown-up person deprived of cortical function by hypoglycaemia.

Other sounds produced in this stage of hyperkinesis cannot be adequately described by human comparisons. They suggested voices of animals, crying monkeys, howling, roaring, barking, quacking or croaking. The visitor to an insulin ward in which were several patients in this stage was reminded inevitably of the noise heard in a menagerie at feeding time. Some sounds defy description and could only be represented by sound recording instruments—a method holding out great promise for the analysis of speech disorder in general. Animal sounds if associated with "climbing movements," as described by one of the authors (M.-G.), are suggestive of regression to another low level of integration.

The similarity of these sounds to those of infants or animals was accentuated by their peculiar emotional appeal to the listener; they seemed to express instinctive feelings mainly of an unpleasant kind. Furthermore, while myoclonic phonations could not be influenced by cutaneous stimuli, the "choreo-athetotic" cries became louder and more urgent in response to pin-pricks or other painful stimulation.

In studying these inarticulate sounds it was noticed that it was rare to have only one noisy patient in the insulin ward at one time; his noise seemed to provoke noisy behaviour in other patients, especially in those who were in the same stage of hyperkinesis. One recalled the imitation of crying among babies in a crèche, or the contagiousness of yelling, barking, etc., among a herd of animals. But while

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infants awaken one another by their cries, and animals respond to the soundings of their kind with lucid sensorium, the observations in hypoglycaemia seem to point to a possible " subconscious," subcortical intercommunication in man. We have certainly seen cases which had hitherto been quiet in their hyperkinetic stage emitting sounds in the same stage from the day on which another patient started ejaculations of the " subcortical " type. Should this observation be confirmed it might explain the changes between the prevailing quiet and restfulness of some days and the noisiness of the same patients on other days at approximately the same hour. A Swiss worker commenting on these changes suggested that meteorological factors might be responsible.

Naturally, little could be ascertained about the patient's own experiences in the stage of primitive sounds; but whereas the articulate ejaculations associated in the myoclonisms seemed entirely forgotten, patients waking from this stage frequently apologized for their noisy behaviour. One female patient was seriously distressed about having disturbed the others by her screeching. She wanted to discontinue her treatment. This preserved memory of the primitive sounds may be due to cortical functions recovering before the subcortical. Consciousness thus looks on as a spectator, and registers the subcortical symptoms still present at the moment of waking up; but symptoms of irritation of the cortex itself, like the sounds associated with the myoclonisms, cannot be recalled.

Discussion.

The inhibition of cell oxidation caused by hypoglycaemia affects first and foremost the cerebral cortex. Parallel with the impairment of clearness of consciousness, indicating, for all we know, a general cortical involvement, speech is disturbed because it is one of the highest cortical functions. In cases without manifest abnormal speech production the loss of speech is an important symptom of depressed cortical function. There is no reason to assume that certain areas of the cortex are more sensitive to the reduced glucose level and therefore earlier affected. To explain cases of aphasia supervening in the waking state as described in the first part of this paper no recourse to localization is needed. The observations can be explained by the principle that the most differentiated of the disturbed functions returns later to normality. The same principle applies to the cases in which dysarthria and kindred symptoms continue for a short time while the patient regains his full consciousness.

The concept of consciousness has been for a long time a bugbear of certain psychological schools. Lately it has been pilloried again as a " crude metaphor," a " misleading one-dimensional abstraction." Paterson (1944) discussing confusional states after closed head injury has pointed out that " circumscribed and localizable functions " are disturbed in these cases, and maintains that he can dispense with the concept of a general disturbance of consciousness. However that may be, the clinical picture of hypoglycaemia cannot be adequately described without recourse to a unitary concept signifying degrees of deviation from the waking state. For lack of better terms, " dimming," " clouding " and " loss of consciousness " have to be used.

It is not an entirely satisfactory concept even so. Paterson's criticism of the quantitative one-dimensional idea of consciousness and its disturbances can be understood in the light of observations like the following: There are in hypoglycaemia at least four types of clouded consciousness, differing from each other not only in degree but also in kind, if their association with different speech phenomena is used as a distinguishing criterion. The clouded condition in which dysarthria and kindred symptoms are present seems unlike that in which echolalia appears. The latter seems to be nearer the waking state. We find a third mode of disturbed consciousness associated with myoclonic twitchings and rhythmic articulation, both probably symptoms of cortical irritation. The clouding here is certainly deeper than in the stages of dysarthria and echolalia, but it seems doubtful if it can be differentiated by degrees of lesser or greater depth from the fourth type associated with " extra-pyramidal " hyperkinesis and primitive sounds. If, however, memory is used as a gauge for measuring the degree of unconsciousness, the stage associated with echolalia and myoclonisms must be considered more

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severe than that in which dysarthria and primitive sounds appear, since only the latter leave some traces behind.

The paradox of these observations and the problem of consciousness in general cannot be solved at present. If we knew more about the functions of different cortical layers, or if recording of electrical potentials could register more refined differences of function, we might perhaps be able to arrive at a better understanding of the underlying mechanisms and of the meaning of discriminations which at the moment are purely descriptive.

The view that hypoglycaemic metabolic changes extend equally over the whole cortex is not shared by Angyal (1937). His theory of speech disorders and other motor symptoms is worth discussing, because it seems to be the only attempt at linking the various symptoms in hypoglycaemia with the underlying schizophrenic illness of the patients under treatment. According to Kleist's (1925) much debated localization of schizophrenic symptoms, it is the parietal area of the cortex which is affected in schizophrenics showing disturbances of thinking and speaking; while catatonic features, mannerisms, etc., are supposed to be due to affection of the frontal region. Angyal, following Kleist's theory, assumes that whichever region is mainly diseased will show most reaction in hypoglycaemia. He thus distinguishes two speech syndromes in hypoglycaemia, the "paralogical and sensory-amnesic" and the "ontogenetic-aphasic." The former corresponds to the group here described as "dysarthria and kindred phenomena." From the author's own detailed record of these speech productions there is no doubt that they are not specific for schizophrenia, but identical with the dysphasia in conditions of clouded consciousness. Angyal's ontogenetic syndrome, however, consists mainly of the regressive and primitive utterances associated with extrapyramidal movements. The presumed correlations with certain types of schizophrenic illness seem to us purely hypothetical, and were not confirmed by our observations. We frequently observed in the same case primitive utterances during coma, and dysarthria, etc., in the waking stage.

Angyal's localization of the "ontogenetic-aphasic syndrome" in the frontal region is closely related to his theory of the oral movements discussed in a former paper (Mayer-Gross, 1941). Mouth movements being so common a symptom of hypoglycaemia, it is not surprising to find them sometimes associated with primitive utterances. In the ordinary sequence of events, however, they make their appearance in an early stage of hypoglycaemia without any sound or speech production. Much later, when the disturbance of consciousness deepens, primitive utterances appear together with a general hyperkinesis of the choreo-athetotic type which sometimes also extends to the oral region. Because of their association with symptoms of the basal ganglia and their similarity with sounds of the infant before complete myelinization of the cortex, we are bound to interpret the primitive utterances as release phenomena after cortical inhibition, and not as signs of irritation of certain cortical areas.

If this interpretation is accepted it can throw some new light on the cerebral functions underlying normal speech development. The instinctive ability to produce primitive sound signals, which can appear in adults if cortical function is depressed, may well have played a paramount role in the development of the human language. Liepmann's frequently quoted simile that speech has grown as a parasite on the feeding function of the mouth region will have to be revised if there is a primary urge to utter sounds after decortication. Surely this subcortical instinctive ability may well be the basic function from which human language starts its development—speaking metaphorically, the wild stock on which language is grafted.

As to the articulate ejaculations associated with myoclonisms, there is little doubt that both symptoms are due to a cortical discharge mechanism. The observation that they may culminate in the scream ushering in a major epileptic fit makes it doubtful whether the traditional explanation of this epileptic cry meets all the facts. It is usually considered to result from a forced expiration initiating the tonic phase of the fit, i.e. as of purely mechanical origin. Kinnier Wilson (1940) maintained that forced inspiration was responsible for the initial cry. There are several reasons for calling these explanations in question. It makes it difficult, for instance, to account for the absence of the cry in a great number of cases which otherwise show all the consistent regular features of the

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major epileptic attack. Furthermore, since therapeutic application of epileptiform seizures has made observation easier, it has been confirmed that epileptics occasionally scream well in advance of the general tonic contraction of the muscles, especially those controlling respiration. In electrically induced convulsions this sequence of events is very common. The observations of hypoglycaemia provide another argument against the purely mechanical origin of the epileptic cry, and in favour of its causation by a cortical irritation. Why the epileptic discharge includes the motor speech area of the cortex in some cases only remains unknown.

Summary.

I. The paper gives a description of disorders of speech caused by impairment of cerebral function in hygoglycaemia. Besides total loss of speech in deep coma, the following disturbances could be observed mainly during the stages of going into and waking from coma:

(1) Isolated dysphasias of the motor and probably of the auditory type.

(2) Dysarthria and kindred symptoms closely related to clouding of consciousness. They are identical with those observed in clouded states of other aetiology. Echolalia, one of these symptoms, is frequent in hypoglycaemia.

(3) Articulate rhythmic ejaculations occurring together with myoclonic twitchings of cortical origin.

(4) Primitive utterances, similar to the lallations or cries of the human infant or to the sounds produced by animals, voiced in the stage of choreo-athetotic hyperkinesis. They are considered to be of subcortical origin released by the inhibition of the cortex.

II. The cerebral mechanism of these disorders is discussed with reference to—

(1) Speech as the most highly differentiated function of the cortex.

(2) Consciousness and its disturbance as a concept signifying deviation from the waking state.

(3) Attempts at localization based on the underlying schizophrenic symptoms (Angyal).

(4) The significance of subcortical sounds for the theory of speech development.

(5) The origin of the epileptic cry.

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AUTONOMIC RESPONSES IN PREFRONTAL LEUCOTOMY.

PRELIMINARY REPORT.

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In bilateral prefrontal leucotomy *inter alia* the fronto-subthalamic, the fronto-septal and fronto-hypothalamic (posterior) projections may be severed, together with reciprocally projecting tracts. These may represent the anatomical basis for the altered autonomic visceral disturbances observed following operations. The reports on bilateral leucotomy emphasize the post-operative "improvement in autonomic functions with a tendency to gain weight" (Vonderahe). After lobotomy transient visceral disturbances make their appearance, such as disturbed sphincter control and slightly but permanently decreased blood pressure, whilst vasomotor disturbances and sweating on the contralateral half of the body have been noted following unilateral lobotomy.

No reports, however, have been published regarding the autonomic responses of leucotomized patients under experimental conditions. The present paper describes the effects on leucotomized patients of drugs which obviously influence the autonomic nervous system, and is thus a clinical study of the way in which the severance of the connecting pathways alters the autonomic visceral responses. The rationale of the experiments was as follows:

The autonomic phenomena which have been described as following the operation (sweating, vasodilation, etc.) are of the peripheral type. If drugs are given with peripheral autonomic actions, a difference in the reaction between the leucotomized and not-leucotomized control cases might be expected.

Method.

The drugs used for the experiments may be classified into three groups: firstly anti-cholinesterases; prostigmine as a quaternary and eserine as a tertiary compound. Both of these enhance the effect of the naturally formed acetylcholine, consequently they reinforce cholinergic actions. It may be recalled that the physiological action of prostigmine, when given intravenously, is an enhancement of the action of the cholinergic terminals. Thus lachrymation, miosis, salivation, increased peristalsis, vomiting, the emptying of the bladder and rectum, muscular twitching, and an increase of the tendon reflexes follow. The action of eserine when injected intrathecally is a central stimulation of motor responses; thus after an initial depressive period it increases reflexes, twitchings result, together with enhanced responses to applied sensory stimuli (Kremer). After intravenous administration similar effects can be observed, but they are covered by the early appearance of violent autonomic cholinergic responses.

The second type of drug used was the anti-amino-oxidase ephedrine. This on intravenous administration reinforces the adrenergic terminals and "sympathetic" over-action is the consequence, as shown by mydriasis, vaso-constriction of the skin vessels, rise of blood pressure, compensatory bradycardia, appearance of extra-systoles, etc.

The third group of drugs used were the sympathetico-mimetic amines; of these benzedrine was chosen, its effect being similar to the adrenergic autonomic actions.

When giving these drugs the technique had to be worked out for each of them separately, and as far as is relevant, it will be separately mentioned when the results with each drug are discussed.

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The female patients chosen for this enquiry were chronic schizophrenics of the excited and catatonic type. Fifteen cases were selected who had various unsuccessful shock treatments prior to leucotomy. This operation was carried out two to ten months before the investigations. None of these cases had reacted favourably to the operation. Three further cases were studied before and after leucotomy. The control group consisted of five chronic schizophrenics and five other psychotics, none of whom had had the operation.

Results.

Prostigmine.—Five c.c. of prostigmine (2½ mgm.) was the average necessary dosage. Too slow an intravenous injection made the effects indistinct; too rapid administration caused vasomotor collapse. To evade subjectivity, the injection speed was standardized for both leucotomized and control cases at 1 c.c. per 20 seconds. The contrasted responses of a typical control and leucotomized case are illustrated by Table I.

Table I.

Control Case.		Post-Leucotomy Case.	
N.G.—, *aged* 30; *schizophrenia.* B.P. 145/100, *p.* 70.		*K. W.*—, *aged* 28; *schizophrenia.* B.P. 135/95, *p.* 74.	
P.M.		P.M.	
2	2½ mgm. prostigmine intravenously.	2	2½ mgm. prostigmine intravenously.
2.5	Reflexes slightly increased. Complains of twitchings around eye.	2.5	Reflexes slightly increased. Complains of twitchings around eye.
2.7	Pallor. B.P. 125/95, p. 68. Reflexes ++. Tap contractions and moderate muscular fibrillation.	2.7	No pallor. B.P. 135/95, p. 72. Reflexes ++. Tap contractions and moderate muscular fibrillation.
2.9	Lachrymation.	2.9	Lachrymation.
2.10	Salivation; eructations; nausea; B.P. 115/85. Generalized muscular fibrillation. Reflexes +++.	2.10	Moderate miosis; salivation. B.P. 125/85. Generalized muscular fibrillation. Reflexes +++.
2.12	Vomiting.	2.12	B.P. 120/80; eructations.
2.14	B.P. 110/80; vomiting.		
2.16	Defaecation, micturition, fibrillation. Reflexes +++.	2.16	Eructations; fibrillation. Reflexes +++.
2.18	Vomiting again.	2.18	Fibrillation. Reflexes +++.
2.20	Interrupted by 1/75 gm. of atropine and 4 c.c. of coramine given.	2.20	Complains of pains; motor symptoms as above. Pallor.
		2.25	Miosis not increased.
2.30	No autonomic symptoms present. Still muscular fibrillation. Reflexes ++. B.P. 135/100, p. 69.	2.30	Motor symptoms as above; passes urine (normal quantity).
		2.48	Interrupted by 1/75th grain of atropine and 4 c.c. of coramine given.

It can be seen that the leucotomized patient, in contradistinction to the control, did not respond with vomiting, diarrhoea and excessive micturition to the prostigmine. When two or all three of these signs did not appear the result has been classified as a typical post-operative prostigmine response. Table II shows the occurrence of these qualitatively altered prostigmine responses in relation to the total case material. It can be seen that in 60 per cent. of the leucotomized patients gastro-intestinal symptoms such as vomiting and diarrhoea were not produced, but on the other hand about half of the cases responded with transient miosis to prostigmine. In marked contrast 8 out of 10 control cases showed vomiting and diarrhoea, and only 30 per cent. produced transient myosis.

Eserine.—The effective dose was 2½ mgm. in a solution of 2½ c.c. of water given intravenously, but at a slower rate than prostigmine. The circulatory effects of the eserine were, however, more violent than those of prostigmine, and collapse occurred frequently. After a short interval with initial depression of the reflexes, patients complained of " something funny " about their eyes, muscular twitching, increase of reflexes, salivation, lachrymation and vomiting occurred, with faecal and urinary incontinence and a marked fall in the blood pressure, and frequently with vasomotor collapse. There was no regularity in the pupillary changes. These responses were similar in both leucotomized and control cases. But whereas the

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TABLE II.

Number.	Leucotomy.	Prostigmine. Miosis.	Saliv.	Vomit.	Diarrh.	Mictur.	T.	Eserine delay.	Ephedrine delay.
1	24 weeks	+	−	−	−	−	×	+	+
2	40 „	−	+	−	−	−	×	−	−
3	12 „	+	−	−	−	−	×	−	+
4	18 „	+	+	−	−	−	×	−	+
5	12 „	−	+	+	+	+	..	+	o
6	10 „	+	−	−	−	−	×	+	−
7	36 „	+	+	−	−	+	×	+	+
8	36 „	+	+	−	−	−	×	+	o
9	24 „	+	−	−	−	−	×	+	o
10	10 „	−	+	+	+	+	..	−	o
11	10 „	−	+	+	+	−	..	−	−
12	10 „	+	+	+	+	+	..	+	+
13	9 „	−	−	−	−	−	×	−	+
14	40 „	+	+	+	+	+	..	+	+
15	24 „	−	+	+	+	+	..	+	+
1	Control Sch	+	+	+	+	−	..	−	o
2	„ „	−	+	+	+	+	..	−	..
3	„ „	−	−	+	+	−	..	+	..
4	„ „	+	+	−	−	+	×	−	..
5	„ „	−	−	+	+	+	..	−	o
6	„ N Sch	+	−	+	+	+	..	−	..
7	„ „	−	+	+	+	+	..	+	+
8	„ „	−	+	−	−	−	×	−	..
9	„ „	−	+	+	+	−	..	−	o
10	„ „	−	+	+	+	+	..	−	..

Abbreviations: "T," typical response. "Control Sch," schizophrenic control cases. "O," no extra-systoles. "Control N Sch," psychotic, not schizophrenic control cases.

appearance of the autonomic symptoms in the control cases always started within 14 minutes, the leucotomized patients produced their qualitatively equal responses in 15 to 25 minutes. Thus, whereas the difference in reaction of the leucotomized and non-leucotomized cases to prostigmine was qualitative, to eserine it was in the time and not the intensity of response. Column 4 on Table II shows the number of delayed reactions to eserine, also the association of the positive eserine and prostigmine reactions.

Ephedrine.—The effective dosage was 1½ gm. in a solution of 3 c.c. of water, which was given as a rapid intravenous injection. Only the circulatory changes were recorded, consequently the "differences" described here only related to this one aspect. It was found that 6 out of the 10 control cases developed extra-systoles 1 to 120 seconds after completion of the injection; 3 did not produce extra-systoles, and 1 developed them in 180 seconds. In contrast to these findings 8 out of 15 leucotomized cases responded with extra-systoles between 120–200 seconds after completion of the injection; 3 produced extra-systoles within 100 seconds, and 4 did not respond with extra-systoles at all (see column 5, Table II). The results on such a small number of cases are difficult to assess; it may be that the comparatively delayed response to half the leucotomized cases is significant.

Benzedrine.—20 mgm. benzedrine was given intravenously 20 minutes after 1/100 gr. of intramuscular atropine. It was hoped that in diminishing the cholinergic autonomic activity by atropine, the sympathico-mimetic effects of the benzedrine would become more markedly manifest. Although the blood pressure rose, only 3 out of the total cases (leucotomy and control material) responded with extra-systoles. Though this may be an interesting point in regard to the action of benzedrine, it does not carry forward the present investigations.

Special cases.—Three cases (A, B and C) were investigated before and 3, 4, 5 and 6 weeks after leucotomy. Before leucotomy all the cases responded with the same autonomic symptoms to prostigmine and eserine, as did the control cases,

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and in Cases A and B there was total vasomotor collapse. A bilateral vertical leucotomy was performed on all three cases, using the McGregor and Crombie leucotome. No changes to the drugs were found in any of the three patients three weeks after leucotomy; Cases A and B again responded with vasomotor collapse, as well as with very severe autonomic reactions. After four weeks, however, the autonomic resistance started to manifest itself. All three cases had marked autonomic reactions, but no vasomotor collapse occurred. Five weeks after the operation the responses were less violent, and again no collapse occurred. In six weeks' time Cases A and B showed typical post-leucotomy prostigmine, eserine and ephedrine responses; Case C a typical post-operative prostigmine result, but the other responses were unchanged from before operation. Cases A and C responded with euphoria to benzedrine, and Case B produced extra-systoles under its influence. Up till now all three cases show a definite mental improvement as the result of operation.

Comment.

The above detailed results suggest that in leucotomized patients there is an increased resistance towards drugs which upset the autonomic equilibrium (homeostasis). They seem to point to the fact that no marked autonomic resistance can be expected less than six weeks after the operation, but it appears that the typical results observed are not always in direct proportion to the time which has elapsed after leucotomy.

Gold emphasized the autonomic disbalance in schizophrenics, and showed that after successful insulin treatment there was a tendency to maintain autonomic equilibrium. The 15 patients who were only investigated after leucotomy had failed to show much mental improvement, though with only two exceptions they produced the typical post-operative reactions to one or more of the drugs used. It would therefore seem that the autonomic resistance is not directly dependent upon the calmer mental attitude after the operation of leucotomy, even although there may be a relationship in the case of insulin treatment. It seems probable that the anatomical basis of the resistance are the severed autonomic projection tracts and not only the cortico-thalamic projections. This, however, remains hypothetical until confirmatory post-mortem findings are available. Furthermore, the parallelism of mental improvement and autonomic resistance in the three special cases may emphasize the important role played by the interruption of the thalamic connections.

Notwithstanding the differences observed, these results are only suggestive and not conclusive. Biochemical investigations would expand and give these observations a more definite basis. It also would be out of proportion to draw detailed conclusions based on the outlined investigation; the number of cases (total, 18) is too small for statistical purposes. Nevertheless the results on this sample of clinical material are indicative of the type of response to be expected, and appear to justify further investigations.

Summary.

1. The reactions of 15 leucotomized patients to prostigmine, eserine, ephedrine and benzedrine were investigated.

2. It was found that after leucotomy there is an increased tendency to maintain autonomic equilibrium (homeostasis).

I wish to express my thanks to the Medical Superintendent, Dr. E. Cunningham Dax, for his helpful criticisms; to Messrs. Menley & James for supplying me with the benzedrine used for these experiments; to the nursing staff, whose enthusiastic help facilitated these experiments.

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OBSERVATIONS ON THE RORSCHACH TEST IN TWO CASES OF ACUTE CONCUSSIONAL HEAD-INJURY.

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I. INTRODUCTION.

THE purpose of this paper is to report some observations on the Rorschach test in two cases of severe concussional head-injury. Detailed studies of such cases in the Rorschach literature are relatively few,* and none, so far as the present writer is aware, includes observations on the test during the more acute phases of the post-traumatic disorder. In addition, therefore, to placing further cases of head-injury on record, it is hoped that our observations may throw light on the psychological changes associated with remission of the post-traumatic confusional state and recovery of normal consciousness. It is further hoped that the Rorschach observations made at a later stage of recovery in these cases may have some bearing on our knowledge and assessment of the chronic post-traumatic condition.

The two cases presented in this paper have been selected from a much wider range of clinical material for the following reasons: In the first place, both patients were young, of good intelligence, and without previous history of nervous or mental disorder. In the second place, detailed records of the course of the confusional state were made in each case, and the residual post-traumatic intellectual and personality changes assessed with particular care. In the third place, apart from some aphasia during the acute period, neither case showed focal symptoms of a type that might be expected seriously to influence Rorschach performance. Thus visual field defects were absent in both cases and neither showed visual agnosia. And in the fourth place, it was later ascertained that the main stress of the lesion in both cases fell on the frontal areas. With due reservation, therefore, our material may be brought into line with a number of earlier Rorschach studies in cases of frontal lobe pathology (*cf.* e.g. Piotrowski, 1938, Nadel, 1938, Harrower-Erickson, 1940).

A method of *repeated Rorschach testing* was devised for this study. The first test, which we shall call *Test 1*, was given relatively soon after admission while the patient displayed a severe degree of post-traumatic confusion. The second test (*Test 2*) was given some weeks later during remission of the confusional state. It was thereby hoped to sample performance during what has been described as the *subacute* or *Korsakow* phase of the post-traumatic disorder (*cf.* Symonds, 1940, Guttmann, 1944). The third test (*Test 3*) was administered after full recovery of normal consciousness and at a relatively advanced stage of convalescence. Needless to say, this method of repeated testing of the same subjects with the same material is open to serious criticism, and it cannot be assumed that the results would have been identical had the patients been tested for the *first* time at one or other of the later stages in recovery. It is nevertheless felt that as a preliminary approach and with proper discretion in evaluating the results the method is worthy of trial.

II. CASES.†

The salient clinical data in our two cases may be summarized briefly as follows:

CASE 1.—Male, aged 27. Severe concussional head-injury with compound fracture of skull: Unconscious 3 days; thereafter apathetic, confused and disoriented for 3 weeks. Some paraphasia at this stage. Further recovery excellent, but at time of discharge 3 months after injury

* Studies available include those of Oberholzer (1931, 1939) and Brussel *et al.* (1942). An adequate account of the general Rorschach picture in post-traumatic conditions has been given by Klopfer and Kelley (1942, pp. 339–43).

† I am indebted to Mr. Norman Dott for his kind permission to study these cases and to reproduce extracts from his clinical records. I have also to express my deep obligation to Dr. Andrew Paterson for permission to introduce material relating to these cases previously published by him elsewhere (Paterson, 1942), and for some invaluable discussion of its bearing on the present study.

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showed slight residual memory impairment and relatively outspoken personality change. Air-encephalography at a later date showed diffuse atrophy of both frontal lobes, affecting mainly the left, and of considerable degree.

CASE 2.—Male, aged 25. Severe contusional head-injury without fracture of skull from a blow in the frontal region. Comatose for 5 days; thereafter gradually recovered consciousness, but at first completely aphasic. Euphoric, confused and paraphasic for several weeks, but full consciousness gradually restored.

On discharge, 6 months after injury, residual psychological disabilities were moderate degree of memory impairment and marked personality change. Air-encephalography at this time showed gross dilatation of the anterior halves of both lateral ventricles and of the anterior half of the third ventricle in particular.

The *previous intellectual level* in these cases was assessed on the combined basis of previous record and post-traumatic intellectual testing. Results given on four different standard intelligence tests administered at a late stage of convalescence (at about the same time as Rorschach Test 3) are summarized in Table I. These results, taken in conjunction with the previous record in each case, left us in no

TABLE I.

	Wechsler verbal I.Q.	Progressive matrices score.	Terman vocabulary.	Kohs blocks score.
Case 1	115	48	69	115
Case 2	113	51	75	120

doubt that both patients attained *a relatively high-grade intelligence level*. In many respects, moreover, this level had been well sustained, and one may note, in particular, that the "non-verbal" intelligence level shows no significant decrement on the "verbal." On the other hand, however, fairly definite indications of impairment were obtained on certain more specialized test procedures. On the Rothmann Sorting Test, for example, both patients gave results strongly suggestive of organic intellectual deficit (*cf.* Rothmann, 1934; Rylander, 1939). In view of the relations which have been adduced by several authors (e.g. Kelley, 1941) between "conceptual disturbances" on Sorting Tests and certain aspects of Rorschach performance, a short comment on the Rothmann test is perhaps in place.

CASE 1.—The patient sorted the 15 test objects readily according to *use*, but could not discover a second method of classification unaided. Given help and partial demonstration, he managed to sort the objects by *colour*. He then spontaneously attempted to re-sort them on a mixed basis of "shape and size," and when questioned about his procedure remarked that he had arranged them with a view to "packing them up." This is an obviously "concrete" mode of reaction. The patient was unable to discover the fourth category (*material*) without much help and partial demonstration, and even so completed the task imperfectly. On a second sorting test (Trist's Progressive Shapes, 1943), the patient discovered the alternative principle of classification on the third trial. This reflects a fairly marked "shift-difficulty" of the type often seen in cases with lesions of the frontal lobes.

CASE 2.—The patient unhesitatingly sorted out the objects according to *use*, but had great difficulty in re-sorting them according to any other principle of classification. He twice repeated his first method with slight and facile modifications. When specifically told to sort according to a method other than *use* the patient eventually managed to classify the objects in terms of *material*. He failed to discover the two remaining principles without much help and demonstration, and again tended to revert to the first method of classification.

It is justifiable to conclude from these results on sorting tests that both patients sustained some impairmant of "abstraction" in the sense of Goldstein and his school (*cf.* e.g. Goldstein, 1936, 1939*b*; Goldstein and Scheerer, 1941.) Some implications of this finding for the Rorschach performance are mentioned in Section VI of this paper.

An account of the *previous personality make-up* in the present cases and an outline of the *personality change* shown in both patients as a sequel to head-injury have been given elsewhere by Paterson (Paterson, 1942, Cases 8 and 9). The main points to which Paterson calls attention may be briefly summarized: The first case (Case 9 in Paterson's series) was formerly of somewhat aggressive disposition but with an excellent previous record notwithstanding. This aggressiveness was greatly exaggerated in the post-traumatic personality picture. In Paterson's words: "The previous underlying emotional attitude was one of aggression and

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euphoria, but modified by the background of Army life and general experience he became a smart, ambitious, disciplined N.C.O. . . . After a head-injury resulting in basal frontal atrophy, the aggressive euphoric attitude unmasked was dominant and persistent, appearing in inappropriate situations no longer modified by those influences and standards which previously had guided it into useful channels" (1942, *loc. cit.*). The second case (Case 8 in Paterson's series), on the other hand, was previously docile and timid in disposition, but had nevertheless achieved a very adequate social and occupational adjustment. Six months after the head-injury, however, this patient's timidity and lack of confidence were noticed to be altogether excessive. To quote again from Paterson: "Before his head-injury the timidity which had been his underlying emotional attitude had been modified and camouflaged by the background of convention (social, educational and athletic) and was scarcely recognizable to the outsider. After the injury . . . the background ceased to play its modifying part so that fear, timidity and anxiety were strikingly displayed" (*loc. cit.*). Paterson, who pertinently comments on the contrasting pictures in the two cases, points out that we see illustrated in both what may be called the *caricature effect* of severe concussional head-injury.

It has been thought advisable to include the above somewhat extensive data relating to the intellectual and personality make-up in our two cases for a number of reasons. In the first place, very little such data is available in connection with many, perhaps the majority, of cases reported in the Rorschach literature. And in the second place, rather extravagant claims have been made from time to time on behalf of the Rorschach test in the clinical field. It is felt that the value of the test will only become apparent when it has become possible to correlate the Rorschach observations with the findings in other spheres of psychological function and with the detailed results of psychiatric assessment generally.

III. Method.

The essential features of the method have already been outlined in the Introduction. It will be recalled that three successive Rorschach tests were administered in each case. *Test 1* was recorded during the more acute phase of the post-traumatic confusional state, and *Test 2* in the course of its remission. *Test 3* was given in each case shortly before the patient's discharge from hospital. The approximate time-intervals between the three successive tests are indicated in Table II:

Table II.—*Weeks Since Injury.*

	Test 1.	Test 2.	Test 3.
Case 1	2	6	10
Case 2	4	7	20

The mental condition of the patients during the course of the confusional state necessitated some modification of the accepted Rorschach procedure. In particular, it was found obligatory to combine the so-called "Inquiry" with the test proper. On Test 3, however, it was possible to give the Inquiry in the usual way at the end of the main test. It is also necessary to point out that the mental state of a severely confused patient in any case renders explanation or discussion of the responses extremely difficult. Consequently, any attempt to tabulate or "score" material obtained at this stage is a highly questionable procedure, and our quantitative results must be treated with due discretion.

The methods of analysis advocated by Klopfer and Kelley (1942) have been followed in so far as the nature of the material and our own limited experience permits. In tabulating the responses, however, the conventional distinction between "main" and "additional" reactions has been largely ignored. Such a distinction was in any case impossible to draw on Tests 1 and 2. It may be added that the modern technique of "Testing the Limits" was in general avoided owing to the possibilities of further interference with performance on the later tests. In Case 2, however, some exploration along these lines was carried out at the end of the last test of the series.

The patients were questioned in some detail on Tests 2 and 3 regarding *recall* of earlier tests and *recognition* of the individual cards. It is obvious that the presence or absence of amnesia for an earlier test must be taken into account in evaluating the effects of our repeated test procedure.

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IV. Results in Case 1.

(1) *Test 1.*

The patient was apathetic, confused and disoriented, and showed little interest in the test material. But he was able to make a response of some kind to every card. Reaction times to the cards ranged from 5 to 60 sec.; mean, 23 sec.

Record.

Card I: Similar to a zephyr anyway; a toad of vanity's like you know.

Card II: A person or persons dressed . . . there's no talisman, you see. (Explains that there are two human figures facing one another. The top red parts are "headgear" and the lower red areas "part of the dress.")

Card III: That still might be the least thing—a talisman actually—two human being talismans confronting each other and using their hands. It strikes me very importantly that they've got their cardigans off and they're both on either side. (Reverses card.) This way they are standing on their heads. *What do you mean by talisman?*—What I really meant by "talisman" is that I had no idea what they were going to do. (Outlines to request the two conventional figures. The outside red areas are said to be the "cardigans flying off." He adds spontaneously that the central red area "looks like a butterfly.")

Card IV: Could be a talisman, of course. *What is a talisman?*—A talisman, truthfully, is a partner of luck. (Reverses card.) Could be a squirrel. *Where is the head?*—Head's away. *The tail?*—Tail's away. *Then where is the squirrel?*—He's probably biffed around the back (points vaguely around and behind the card).

Card V: That might be the other part of it. *Of what?*—It's a talisman, all right. It's a being of luck. It's joined by something that is opposite itself—joined at the shoulders. (Cannot clearly demonstrate what he perceives, but spontaneously discovers a new interpretation based on the symmetrical halves of the blot: "Two people or animals hadding toward each other." *Hadding?*—Diving towards each other.)

Card VI: Well there again I don't think I should be far wrong if I gave it as a burr. *What is a burr?*—Father burr. One of these things that stands and fights (patient mimics a boxing attitude) . . . although it's stuck. (Asked to explain, says: "Did I say it was a burr? If so, it was the wrong one! *What is this one?*—They both look like shoulder-burrs—animals—a wee dog. *Does it look like an animal?*—Yes (demonstrates), here's the head, the feet. A shoulder burr would make up off its hands and feet.)

Card VII: This could be a photostat. *Of what?*—Of something I have just told you about. Something younger than I just told you of. There's a person there—the top of one.

Card VIII: Here again is something similar. *What?*—A photostat of something which given a fair chance might be able to manage into health. *What can you see there?*—They're all dead. *What are dead?*—Kittens, I suppose (indicates lower red areas). *Anything else there?*—Life is being made up of unknown quantities. *Whose life?*—Their life. *The kittens?*—Yes. *What are the unknown quantities?*—Food (points to blue area). Just eats.

Card IX: I can't be sure. It's a satellite anyway. (Points to two orange and then to two green areas.) I see one, two, three, four satellites.

Card X: It's a photostat of the gambling do. (Asked to explain, patient merely enumerates the colours on the card and says the blots might be animals.)

Tabulation.

Responses: 13 (Main: 10; Additional: 3). *Location:* W: 10 (Arbitrary: 6; Inaccurate: 1; Unelaborated: 1; Organized Popular: 2). D: 3. *Determinants:* FM: 1; m: 2; F: 10 (F−: 8, of which 4 are inaccurate outline and 4 of partly perseverative type). *Contents:* H: 2; A: 4; Aobj: 1. Remainder unclassifiable.

Comment.

The above tabulation, admittedly arbitrary, suggests that nearly all the responses are based on *form*, alone, but that the correspondence between the actual shapes and the imaged concepts is grossly defective. Apart from a suggestion of *animation* in a few cases no further aspects of the stimulus material are taken into account. The reduced, constricted and perseverative character of perception is further shown by the high proportion of inferior whole answers (W−) and the limited range of content categories.

Evaluation of this record is scarcely possible, but there are a few properties of the responses that merit brief discussion. In the first place there is a decided tendency to respond to each successive card *as a whole*, although on occasion the bilateral symmetry is appreciated and woven in to the response. In the second place, the frequent use of *bizarre and inappropriate words* (e.g. "talisman," "photostat," and "satellite") is very striking. It is difficult to say how far (if at all) the

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patient recognized the meaninglessness of such words in the present context, but in the case of " talisman " at least he appeared to have a fair idea of its usual meaning. In the third place, *perseveration* is strongly marked in the verbal answers. And in the fourth place, the *irrationality* of behaviour and thought at times goes beyond mere paraphasia. Thus one may note especially the comment *à propos* of Card VIII that " Life is being made up of unknown quantities," and its further elaboration in terms of the perceived material.

(2) *Test 2.*

The patient was alert and responsive although still amnesic, disoriented and lacking in insight. He had no memory of the previous test and recognized none of the cards. Reaction times varied from 5 to 30 sec.; mean 15 sec.

RECORD.

Card I: (1) A pelvis—skeleton of a pelvis. (Card reversed.) (2) Photo of a block of land with four lakes in the middle (explained). (3) Two bears standing on one leg holding something up. (Outlines the " bears " clearly and explains that they appear to be holding a man with his legs forward. The man is dead and the bears are quarrelling over his carcass or are " attacking him anyway." He adds that the bears are spotted with fur or dirt.)

Card II: (1) Might also be two standing bears, though they haven't got their heads showing, with two carnival hats. They seem to have something on the one hand—not claws as long as that. Probably the two bears have been fighting . . . . for their legs are covered with blood, you know. (Outlines the figures fairly adequately to request. The upper red areas of the card are interpreted as the " carnival hats "). (2) (Reverses card.) A lake or tributary, a river or something (mainly central white areas).

Card III: (1) Two waiters attempting to shout or something. They might be two baboons or monkeys actually, attempting a similar civilian thing—masquerading, that is to say. The top of the body seems away from the legs—cut at the hips. (Outlines the conventional figures to request; they are not seen as if in motion, but are " shouting, quarrelling, having an argument." These human figures could also be baboons " masquerading as human beings "—" they might be from a zoo and fairly civilized.")

Card IV: (1) Might be a dead animal covered with fur. It seems to have too big (hind) legs for its forward legs. It's also got eyes. (Form outlined fairly adequately. Patient comments on discrepancy in size between " front " and " back legs.") (2) Might be a fur coat. (same outline as for (1).)

Card V: This might also be a young dead animal. (He thinks the whole blot might represent an animal " dissected in half." The blot gives him a strong impression of animal fur.)

Card VI: (1) Also a small animal—two eyes again in the forward part of its head; a spine, four legs. (Outlines whole blot to request and again says the animal might be dissected. Asked whether it appears alive to him, the patient said: " It might be an animal attacking something that's living and got into its mouth and died itself like.")

Card VII: (1) Two dogs tied back to back. They don't seem to have any rear legs, and there's something on the end of their noses. (Concept is based on whole blot. Patient insists that the " dogs " have something on their noses—" Some form of masquerading on his nose.") (2) Two dogs attacking something else (modification of (1)). They are attacking some form of meaty stuff. (3) If a piece of land, as it might be, there are plenty of places where there are ways for water. This (white space) could be an inland lake.

Card VIII: (1) Some form of red cabbage with the top leaves dead. (2) Two rats attacking . . . might be attacking the top of a cabbage. (3) A bony spine up the middle. It forks half way. (4) If it's a piece of land there's plenty of water there in the middle—plenty of lakes.

Card IX: (1) This could be something that's masquerading as a pair of poms. The legs are in front; they seem to have a bigger chest than they do stomach. (Outlines upper orange and green areas.) Explains that the " poms " are " dressed up in fancy clothes " and that " they could be playing together—or quarrelling." (2) This could be a sea-shore and coloured sands and woods, looking at it from above (explained).

Card X: (1) A mixture of rubble on the floor or on water. (2) Might be animals of some kind (central red) and an insect attacking them (brown). (3) Two insects (explained). (4) Or these two things (outer blue) might be attacking these two things (central red) . . . they might be things which could be eaten by them. (5) All the things look as if they might be part of a picture of certain animals or birds. (6) These two big things (central red) might be land. (Explains that it might be a coloured map.)

TABULATION.

Responses: 29 (Main: 23; Additional: 6). *Location:* W: 14 (Arbitrary: 2; Inaccurate: 3; Unelaborated: 3; Organized Popular: 6). D: 8. S: 3. *Determinants:* FM: 3; m: 3; FK: 1; F: 8 (F–: 5); Fc: 4; c: 1; C′: 1; FC: 4; CF: 2. *Contents:* H: 2; A: 9; Ad & Aobj: 4; Geo: 5; Obj: 1; Plants, etc.: 1.

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COMMENT.

Comparison with Test 1 (*cf.* Fig. 1) shows: (1) An increase in responses from 13 to 29. (2) Some improvement in quality of W and a higher proportion of responses based on D. (3) An increase in the range of determinant-categories from 3 to 9. (4) A relatively large proportion of responses based on fairly high-grade combinations of F with M, c and C elements. (5) A wider scope of contents.

This record reflects a very considerable improvement in the level and quality of perceptual interpretation. The total number of responses is more than double that given on Test 1, and many of these are based on combinations of determinants and fairly well-defined areas of the cards. Speech is coherent and only a vestige of paraphasia is still in evidence (e.g. " civilian " for " civilized " to Card III). Perseveration in general is far less outspoken, but there is still undue repetition of response, for example " dead animals " are given for Cards IV, V and VI, and " land and water " to Cards II, VII, VIII, IX and X. The trend of thought is rational on the whole, although rather strange interpretations are given from time to time (e.g. the response to Card VI). It is doubtful, however, whether these go beyond the normal range of phantasy as displayed in the test setting.

A striking qualitative feature of this record, especially interesting in view of what has been said regarding this patient's personality structure, is the *theme of aggression and physical conflict* which runs through so many of his responses. Thus the " bears " imaged in Card I are said to be " quarrelling over the carcass of a man," and those in Card II to have their legs " covered with blood from fighting." In Card III the " waiters " are " shouting, quarrelling, having an argument," and in Card VI an animal is said to be " attacking something that is living," and then to have died itself. Similar aggressive ideas, expressed for the most part in relation to animals attacking or quarrelling over food, recur in the responses to Cards VII, VIII, IX and X. It is unlikely that this recurring theme of conflict and aggression can be due, wholly at least, to mechanical perseveration. One may suggest that it derives from the " underlying attitude of aggression " of which Paterson (1942) has spoken in this case.

It is noteworthy that no card was recognized, and that none of the responses given on Test 1 were repeated on the present test.

(3) *Test 3.*

The patient's intellectual capacities were by now largely restored, and he co-operated on the test in an essentially normal manner. Reaction times varied from 5 to 40 sec.; mean, 19 sec. The patient recalled one previous test (actually the second), but recognized only the first blot with certainty.

RECORD.

Card I: (1) Pelvis. (2) Skeleton of a bat. (3) Piece of land with four lakes.

Card II: Two bears dressed up in carnival attire. They have something like a claw, or pig's trotter, in their hands. They might be trying to dance—or even fighting. (Explains that the upper red areas are " carnival hats " and the lower red areas " part of the carnival dress.")

Card III: Two waiters; the bodies are away from the legs unless there is something round their middle. They seem to be squabbling over something—it looks like a coal-scuttle—in the middle. Or they might be two monkeys masquerading as waiters.

Card IV: Not unlike a fur coat of some description. It might have a head on it even. (Specifies also " feet " and " eyes.")

Card V: (Reversed.) A small animal—two small animals. They seem to be butting one another, or playing. (Outlines the figures roughly. He remarks that the " fur " is very prominent.)

Card VI: Some form of animal or mammal. It seems to be eating some other animal, or to have eaten it—it's dead. (The large lower area of the blot represents the first animal and the smaller upper part the second. The head of the latter is said to be held in the throat of the first animal, and the patient exclaims that " he might have been swallowing him and got himself fairly choked.")

Card VII: (1) Two animals again gallivanting about the place. Or it might be two things dressed up in a masquerade, you know. (Each half of blot represents one animal and " they might be doing some form of dance, as though butting each other in the rear.") (2) Three different animals having a game of some description (explained).

Card VIII: (1) Two rats or animals of the minor kind really. They seem to be going to eat something or attack something. (2) Two more animals at the bottom lying down (orange).

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(3) Some form of bones (central blue). They could be animal or human bones which the rats are attacking. (4) A red cabbage of some description.

Card IX: Two human beings or animals masquerading. They are dressed in coloured clothes. They may be going to dance.

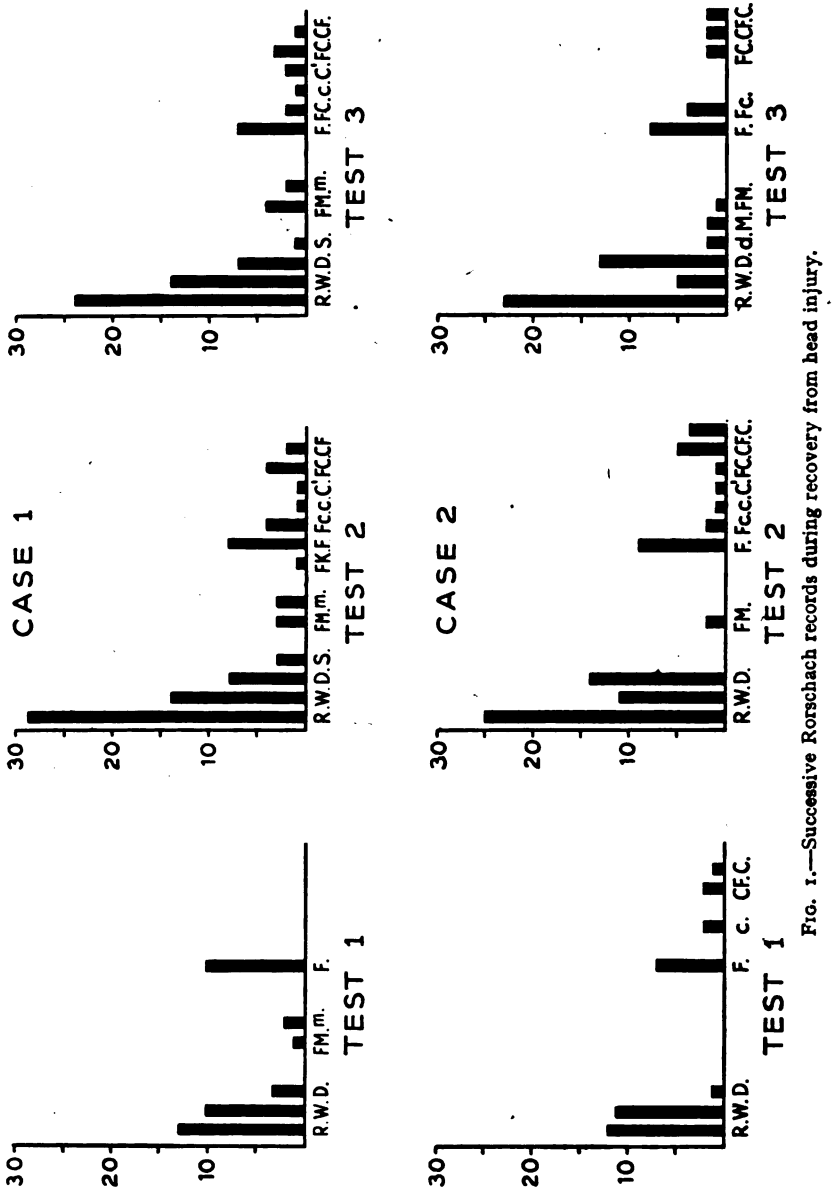

FIG. 1.—Successive Rorschach records during recovery from head injury.

Card X: (1) A jumble of mess really. (2) Animals, fishes, or even birds of certain breeds. These might be crabs (outer blue). (3) Two people (large red) more than anything else. Might be masquerading—about to do some kind of dance. Some sort of animals or fish stuck to their coats.

TABULATION.

Responses: 24 (Main: 19; Additional: 5). *Location:* W: 14 (Arbitrary: 1; Inaccurate: 2; Unelaborated: 5; Organized Popular: 6). D: 6; d: 1; S: 1. *Determinants:* FM: 4;

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m: 2; F: 7 (F–: 6); Fc: 2; c: 1; C': 2; FC: 3; CF: 1. *Contents:* H: 3; A: 8; Ad & Aobj: 3; At: 2; Geo: 2; Obj: 2. Pl., etc.: 1.

COMMENT.

The quantitative results are very similar to Test 2, as inspection of the corresponding graphs in Fig. 1 (Case 1) will show.

The most noteworthy feature of this record is the very general likeness which it bears to Test 2, despite the marked improvement in the patient's mental condition which had supervened. No less than eight of the responses given to individual cards on Test 2 were repeated to the same cards on Test 3 with only slight modification. It is, nevertheless, important to bear in mind that the patient was not himself aware that he was repeating much of what he had said before, and indeed on one occasion (Card V) he " carried over " a response given to the corresponding card *on Test 1*, despite the fact that he had no memory of this test whatsoever.

Certain *qualitative aspects* of this record deserve comment: Firstly, aggressive ideas are expressed much less freely than on Test 2, and often appear in veiled form. Thus the " bears " imaged in Card II which on the previous test were said to be " covered with blood from fighting " are now merely " trying to dance—or even fighting," and there is no mention of blood. In the same way the " animals " on Card VII which were previously " attacking " are now merely " having a game." In a few cases, however, more specifically aggressive ideas are read into the content (e.g. Cards III and VIII). Secondly, the responses on this test tend to be briefer, more to the point, and less discursive than on the previous test. There is now no single instance of paraphasia, and even the perseverative repetition has greatly diminished. Thus the concept of " land and lakes " which was given five times on Test 2 now appears only once. From the qualitative point of view, therefore, one may conclude that the trend in the direction of normal Rorschach performance has been further continued.

This record, despite the above-mentioned improvement, would certainly suggest an organic syndrome to the experienced Rorschach worker. One may note, in particular, firstly that the W : D ratio is still heavily weighted in favour of W; secondly, that the F–% remains disproportionately high for a patient of I.Q. 115; and thirdly, the lack of M response. All these features are consistent with an organic deterioration. At the same time, it is important to bear in mind that many features of this record may arise, in part at least, from a mechanical " carry-over " from the second test. At any rate, we cannot assume in the absence of further evidence that the " organic signs " bear the same significance as they would do had they been present in a record obtained from a patient tested *for the first time* at a comparable stage of recovery.

V. RESULTS IN CASE 2.

(1) *Test 1.*

The patient was restless, grossly confused, disoriented and euphoric. His speech was rambling and paraphasic and at times incoherent. He co-operated readily on the test and the reaction times were extremely short (5 sec. or less throughout). Much of what he said was so diffuse and incoherent that a verbatim record was unobtainable. But the following protocol gives an adequate idea of his performance.

RECORD.

Card I: That's South Africa and England in the South. The marking is not correct . . . Newfoundland.

Card II: That's South America, or it may be the South of England . . . Matapan . . Honduras . . . that's India (continues with a string of names of countries without reference to the Card. When asked where he sees the maps of the various countries, he begins to name the colours on the card, e.g. " That looks red, that looks brownish-red, etc.").

Card III: That's like India, part of South America. The colour looks as if it had been spilt. Looks like the Havanas—that colour over there; the Honduras, etc.

Card IV: That's like the South of Africa. It looks like a couple of hides, like a couple of skins. This looks like somebody's hide with some skin; looks as though there may be some feathers attached to it.

Card V: It looks like a skin with legs—calfy legs. Animal legs. That leg will probably be about three years old. Double-legs there; ears there, and cheeks. *Is it a kind of animal skin?*—A groat or a thatched animal.

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Card VI: A reindeer from somewhere in India. Skin, hind legs and hind-figure of a cat or a wolf.

Card VII: The legs and back of an animal which is one-two-three-four. Which is an animal of four skins. Back of a rabbit, a "sue."

Card VIII: The back of a dog, "sue," that's the back of a dog's figure. That reminds me of a shoulder, that of a chest—a red chest. It looks like shoulders as they are in November. A poker in late Autumn, and it's pink. There's nothing red about it. If it's red it should be the colour of a flash and if it's grey the colour of a fir.

Card IX: The brown is a bird's head or breast. It's what we were on just now—something's skin. This is pink; something not too well done. It looks as if it might be raw. *Raw meat?*—Yes, the red looks like rawish meat with a wholesome taste. The green looks as if it might be wild—wild meat.

Card X: Well, the pink is blue meat; the blue is good meat. *What do you mean?*—Well, you always have blue with eastern meat—or western meat. Red—scaly. Brown there is furry. The green and grey—the grey is made of bones and the green should be antelope. *Why?*—Because it looks as though the green has got plenty of flesh about it and the blue has got plenty of flesh about it and the antelope has got plenty of flesh about it. This is like an animal, and the blue looks eastern, south-eastern; the red looks eastern, or south-eastern red; the brown looks southern, etc.

TABULATION.

Responses: 12. *Location:* W: 11 (Arbitrary: 5; Inaccurate: 2; Crude Determinants 4). D: 1. *Determinants:* F: 7 (All F–; inaccurate, confabulative or perseverative). c: 2; CF: 2; C: 1. *Contents:* A: 1; Ad & Aobj: 7. Geo: 4. Remainder unclassifiable. *"Organic Signs":* M; Rpt; Cn.

COMMENT.

The above analysis if of course very arbitrary. One may note that almost all the responses are inferior W in type mainly based on arbitrary form and crude colour. The scope both of content and determinants is very limited. Colour enumeration (Cn), perseveration (Rpt) and kindred pathological features are very marked.

We find, as with Case 1 at this stage, that in so far as the responses are relevant they depend on a very superficial impression of the blot as a whole, or upon some ill-defined aspect of the material such as form or colour. In one case the patient obviously appreciated the fact that the blot was symmetrical (Card IV), and with several of the coloured cards he tended to enumerate the individual colours present. Of the various potential determinants, only form, texture and colour are taken into account, and responses based on texture or colour are seldom brought into genuine relation with the shape. The restricted character of performance is brought out in Fig. 1 (Case 2).

An interesting feature of this record is the example it provides of the way in which free-associational thinking (at times amounting to virtual flight of ideas) can operate in the framework of a rigid and perseverative theme of interpretation. Thus Cards I to IV are treated as "maps," and to that extent the reaction is stereotyped, but in each case the patient pours forth a string of names of countries which are applied indiscriminately to the material. In the same way the idea of an "animal skin" clearly governs reaction to the following five cards, but here again we find arbitrary and irrelevant enumeration of parts of the body and so forth. The co-existence of perseveration and discursiveness in the post-traumatic case, to which Paterson especially has called attention, is beautifully illustrated in this behaviour.

The incoherence of thought is even more outspoken than in Case 1, and it is likely that part at least of his nonsensical comments must be ascribed to the focal aphasia. But in view of the difference between this record and comparable records obtained from cases of jargon aphasia without confusion it appears necessary to postulate also a primary disturbance of the thought process.

(2) *Test 2.*

The patient's mental condition had considerably improved at the time this test was given. But he remained facile, amnesic and mildly disoriented. He recalled nothing of the first test and recognized none of the cards. Reaction times were between 5 and 15 sec.; mean, 7 sec.

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RECORD.

Card I: (1) If not a map it's an animal—a bear or something (explained). (2) A silhouette of a person—the legs and hands are there and the hands appear to be moving. The body looks dark as though blood is flowing in it.

Card II: (1) This is part of an animal—a silhouette (outlines and explains). It looks as though there's some fire on it, or probably blood—it's more likely to be fire. If it is blood both his front and back legs have been injured. They are pressed against the back of the picture. (2) This line (small detail) is to measure up the size of the animal.

Card III: This is a man from the back view (outlined accurately). That is probably part of his head and that part of his chest, but there is no other sign that he has injuries. *Why should he have injuries?*—The blood marks on the other pictures were injuries. *Are the red parts here blood too?*—Yes sir. Or the marks of something that contains blood. But his eyes don't show any blood.

Card IV: Like an animal of a type. The body of an animal dressed apparently in fur (patient strokes surface of blot). The shape of the head suggests cattle—cow or bull. Its eyes are open.

Card V: A silhouette of something that flies. Probably something in the rabbit line—rabbit or hare. (Outlined in conventional manner; the animal is not in flight, but the legs are "kicking about." A small detail is said to be "a bone out of the chest.")

Card VI: Either a sea-water animal or a fish by the shape of it. It's got a neck with a growth on it—possibly a tortoise. Possibly a skin of a water animal—fish or porpoise. *Is it alive or dead?*—The eyes don't look dead.

Card VII: (1) A part of a map or plan or something. (2) A flying animal (explained).

Card VIII: (1) A bear. (2) Some foliage or some part of the grass. Part of the bear's fur or skin has apparenly grown on to the foliage and there's a shadow on the foliage. It's probably bleeding. I think there is probably blood at the back. He's looking round for something up the tree—up the foliage.

Card IX: (1) Probably a bird in the tree; its head's in the foliage. *What kind of a bird?*—Obviously a bird that can be killed. If it can be killed it can be eaten. From the appearances I'd say a parrot (outlined). (2) Sheep's head, and some fur of the animal—some feet of the animal, probably attacked, clawing to the trunk of the tree (explained).

Card X: (1) Like a bone (explained). (2) Blood or something that feeds blood (red areas), or a flash of some kind. (3) Animals (blue). They've got arms and legs and a tail and something (green) in their right arms. (4) Figure of an animal at the bottom—rabbit's head. (5) There is some yellow to the side of the animal. *What might it be?*—A reflection of the light; shade of a tree or something. (6) Looks like a couple of spoons (centre), but is probably a part of the bone of the animal.

TABULATION.

Responses: 25 (Main: 23; Additional: 2). *Location:* W: 11 (Inaccurate: 3; Crude Determinants: 1; Unelaborated: 4; Organized Popular: 3). D: 14. *Determinants:* FM: 2; F: 9 (F−: 4); Fc: 2; c: 1; C′: 1; FC: 1; CF: 5; C: 4. *Contents:* H: 2; A: 8; Ad & Aobj: 3; Geo: 1; At: 1; Obj: 2; Colour: 4. "*Organic Signs:*" Rpt; Cn; M.

COMMENT.

This record shows many quantitative changes in the direction of more normal performance. One may specify (1) a 100 per cent. increase in R; (2) a W : D ratio weighted in favour of D; (3) an increase in the number of determinant-categories from 4 to 8; (4) an increase in scope of contents. On the other hand, these criteria of improvement are offset by a number of features indicating organic impairment. These include (1) an instance of colour-naming (Cn); (2) repetition of the same or of a related response to several successive cards (Rpt); (3) many inferior W responses with indications of a confabulative mode of reaction; (4) prevalence of CF and C; (5) lack of M.

The above record, whilst obviously abnormal, is far more coherent than its predecessor. The responses are less hasty, often quite well considered, and bear a less arbitrary relation to the objective qualities of the material. Many indeed are based on relatively well-defined parts or aspects of the cards. The determinants, too, are more numerous and more varied in their combinations. Free-associational thinking is no longer in evidence and paraphasic words have entirely dropped out.

The responses on this test are not determined to anything like the same extent as on Test 1 by stereotyped themes of interpretation. But one may call attention to a certain preoccupation with ideas of *injury and mutilation* which are freely expressed on the test. It is worthy of note that this patient, unlike Case 1, makes no reference to scenes of physical conflict. He nowhere attempts to account for the causes of the injuries he so freely describes. In this emphasis on the theme of injury, interpreted in a somewhat passive manner, we may perhaps trace not

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only the effects of improving insight into the fact that the patient had himself been injured, but also some influence of the prevailing attitude of apprehension and timidity.

(3) *Test 3.*

The patient had fully recovered from the acute effects of his injury when this test was given. But he showed fairly marked residual impairment in the psychological sphere. He could vaguely recall a previous test, and commented spontaneously that "some of the cards had blood on them." He could not specify whether the given cards were or were not identical with those previously seen. Reaction times lay between 5 and 40 sec.; mean, 13 sec.

Record.

Card I: (1) A man with his hands raised. (2) A bear beside him. (Both responses explained.)

Card II: An animal of a type with one paw up and its head and leg both injured (explained). The patient called special attention to the detail which, on Test 2, he said was "to measure up the size of the animal," but this time confessed that he was unable to understand what it meant.

Card III: (1) Two men or animals facing one another (clearly outlined and explained). (2) Spots of blood—nothing to do with the men's bodies.

Card IV: A cow's head and the back part of it. It could be the fur of a cow put down on the ground—skinned.

Card V: A rabbit flattened on the ground—head, fur and back legs (explained).

Card VI: Some sort of animal with a long neck and webbing out of the side of its head and a fur on. (Explains in detail.)

Card VII: (1) Butterfly (large detail). (2) Some sort of animal.

Card VIII: (1) An animal, walking. (2) This green part I should imagine is water.

Card IX: (1) A piece of bone. (2) A gnome (top orange). (3) I should imagine this (crimson) was blood, but there is no shape to it.

Card X: (1) A rabbit's head (usual detail). (2) Two animals. (3) A bone (explained). (4) Two spoons. (5) Two people pointing (well defined small detail in blue area).

Testing the Limits.

The patient had considerable trouble in perceiving some of the conventional interpretations of the cards when these were suggested to him. With regard to the suggestion of "bow-tie" for the central red area on Card III he said: "If those were waiters and that was the size of their heads the bow-tie wouldn't be that big." This remark is of a type not unusual in cases of organic intellectual deterioration.

Tabulation.

Responses: 21 (Main: 20; Additional: 1). *Location:* W: 5 (Unelaborated: 2; Organized Popular: 3); D: 13; d: 2. *Determinants:* M: 2; FM: 1; F: 8 (F−: 2); Fc: 4; FC: 2; CF: 2; C: 2. *Contents:* H: 4; A: 7; Ad & Aobj: 3; At: 2; Obj: 1. Nat: 1; Colour: 2.

Comment.

The quality of interpretation shows some further improvement on the level of Test 2. The W : D ratio now stands at 1 : 3, the W responses show some improvement in quality, and the level of form perception is tolerably high. Some M response is now present and there is a drop in CF & C. All these features are in the direction of normal Rorschach performance. At the same time, Rorschach workers will at once note the discrepancy between the very humble psychological level which this record indicates and the high level achieved on the psychometric tests. The patient's behaviour on testing the limits of his capacity for interpretation at once calls to mind an organic condition.

The relation of this record to its predecessor is very similar to what was found in the previous case. A good many specific responses are "carried over" from the second to the third test, and indeed in eleven cases the general character of what is said on the two tests is recognizably the same. At the same time, some novel features do appear in the record—in particular the two high-grade "human movement" responses to Cards IX and X. Several of the more bizarre interpretations given on Test 2 are not repeated on the present test, and thought in general is obviously more highly controlled. In only one case, moreover, does the theme of physical injury so marked on the previous test come to clear expression (Card II). All these changes reflect some improvement in the patient's psychological status generally.

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VI. Discussion.

Let us first consider the general character of Rorschach performance during the *acute* phases of the post-traumatic confusional state. The records obtained, as we have seen, are so incoherent and bizarre as virtually to defy analysis. Yet they have certain characteristics in common that merit brief discussion. In the first place, the general tendency was to treat each card *as a whole*, admittedly an ill-defined whole, and one, moreover, in which some particular stimulus-aspect (texture, form or colour) was clearly predominant in governing the response. It was further observed that the patients did not as a rule seek further interpretations once a response had been given, and it is easy to suppose that a confused patient is unable to fit more than one interpretation to a single equivocal blot. In the second place, the *range of response* was extraordinarily limited, as was shown on the one hand by the limited and inadequate use of the various Rorschach determinants, and on the other by the stereotyped, perseverative themes of interpretation. These features are by no means peculiar to the present patients, and we have in fact found them in all the cases of severe head-injury we have had occasion to test at a comparable stage.

The above-mentioned features of the Rorschach behaviour can be related without difficulty to the *generalized limitation of cognitive activity* which many authors believe to be characteristic of the confusional state (*cf.* Symonds, 1937; Goldstein, 1939; and, especially, Paterson, 1942). Thus the tendency to react to some isolated aspect of the stimulus material, for instance a crude impression of texture or shape or a single bright colour, can be treated as a special example of the "perceptual restriction" to which Paterson (1942), in particular, calls attention. In the same way, the perseverative tendency expresses the confused patient's inability to modify response in accordance with objective changes in the stimulus material. It illustrates the temporal as opposed to the spatial aspect of restriction in perceptual consciousness.

The theoretical position is rather less simple when we turn to *the paraphasic and incoherent language* in which so many of the responses were formulated. It is difficult to say how far this is a symptom of focal involvement of the speech areas and how far it forms part of the general confusional reaction. We must, of course, recognize that not all cases of closed head-injury show dysphasic reactions and, as Paterson (1944) has pointed out, in those that do the latter differ in no obvious way from the symptoms presented by cases of circumscribed focal lesion of the speech areas without confusion. Certainly, the two cases discussed here showed dysphasia on a variety of tests (in particular object-naming), and we have, on the other hand, unpublished Rorschach records from other and equally confused cases which show no paraphasia whatsoever. It is therefore likely that much, at least, of the incoherence of the present records can be attributed to a focal language disturbance in the sense of jargon-aphasia. At the same time, it is difficult to believe that the irrationality of so many of the responses can be attributed without remainder to a disorder of language in its purely formal aspects. Thus several of Case 1's responses at this stage show no abnormality of syntax or word-choice, yet express ideas so bizarre as to suggest Rorschach behaviour in the primary psychoses (see, e.g., Beck, 1937, 1938). One may recall in this connection this patient's remark apropos of Card VIII that "life is being made up of unknown quantities," and other kindred comments. One may also bear in mind that Case 2 gave some decidedly unusual interpretations on the *second* test despite the fact that the dysphasia shown earlier had cleared up. When questioned about a "bird" imaged in one of the blots, for example, the patient said that it was "obviously a bird that can be killed," and added that "if it can be killed it can be eaten." He then explained that the bird might represent a parrot. Statements of this kind cannot be dismissed as merely "paraphasic" in the ordinary sense of the term. They would appear to reflect a more generalized disturbance of affect and thought.

There are certain well-marked *differences* between our two records on Test 1 that call for brief comment. In the first place, the *reaction times* to the cards were relatively long in Case 1 and extremely short in Case 2. And in the second place, Case 1's responses were brief and uninformative, whereas those of Case 2 were florid, discursive and uncontrolled. These differences may be correlated without difficulty with differences in the clinical picture shown at the time. Case 1 at this

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phase was retarded and apathetic, whereas Case 2 was excited, euphoric and verbose. It is worthy of note that on the second test Case 1 gave shorter reaction times and a greater quantity of interpretative material, whereas Case 2 gave longer reaction times and less material. These differences are of some interest in view of Paterson's recent and important contention that " the confusional state is always an individual affair to be studied as such " (Paterson, 1944). One may suggest that the Rorschach method may prove of some service in helping to delimit the patterns of individual variation.

We may now turn to the Rorschach behaviour during the *subacute* (Korsakow) phases of the post-traumatic disorder. We have endeavoured to show in the previous sections that Rorschach performance in both cases on Test 2 reflected a significant improvement in psychological status. This improvement, in its quantitative aspects, can at once be seen on comparison of the corresponding psychograms in Fig. 1, which may also be compared with normal records available in the Rorschach literature (e.g. Harrower-Erickson, 1940). We have also remarked that the records at this stage show a big recession in paraphasic and otherwise peculiar responses. At the same time, relatively pronounced abnormalities of a type not unusual in cases of cerebral lesion were still in evidence. We have also commented on the striking manner in which Rorschach response at this phase was governed in so many cases by *strongly emotional themes*. The *leit-motif* in Case 1 was the idea of aggression and physical conflict and in Case 2 injury or mutilation. Such ideas were much less in evidence on the third test despite the fact that it was at about this time that the personality changes which have been described above were so strikingly in evidence. If we are justified in bringing these features of Rorschach behaviour into relation with the personality make-up our findings may have some clinical application. Thus one may suggest that when cognitive *critique* is imperfect, as is the case during the subacute phase of the disorder, dominant affective attitudes may be freely expressed in projected imaginal responses. With fuller restoration of cognitive *critique*, as in the stable post-traumatic condition, such attitudes may no longer be expressed so freely on a projection test despite their influence on overt behaviour. It would then follow that a Rorschach test given at a *fairly early stage* in recovery from the effects of head-injury may bring out dominant emotional trends and effectively foreshadow the direction of a later personality change.

It is difficult to conclude very much from the records obtained during late convalescence. In both cases, responses on Test 3 were obviously influenced to an overwhelming extent by what had been said on previous tests—despite the somewhat imperfect recollections entertained by the patients of such tests. The question of how far psychological assessment based on the final records is vitiated by this factor of repeated testing must be left open. On the one hand, we may point out that the difference in results between Tests 2 and 3 is relatively slight, despite the marked improvement registered by the patients in the corresponding interval. On the other hand, however, it may be borne in mind that the picture given in each case on Test 3 is not wholly out of keeping with the poor performance on " abstraction " tests (*cf.* Section II) and the psychiatric opinion of deterioration and personality change.

It may justifiably be asked whether the Rorschach records obtained on the three successive tests furnish any data of clinical value which could not be elicited by simpler and more orthodox methods of examination. As regards the findings in the confusional state, it is of course true that many of their most salient characteristics could be brought out equally well on interview or with tests of a more conventional type. At the same time, it is our view that material of the Rorschach type presents certain specific advantages which may not be wholly without importance from the more strictly clinical and utilitarian point of view. Of these, the most important is the fact that the Rorschach method, unlike the great majority of tests in current clinical use, allows us to gain some insight into the patient's emotional make-up, as well as providing an indication of his intellectual *niveau*. In the normal, proper performance calls for a certain balance between the demands of objective perception on the one hand and the free expression of phantasy on the other. Indeed it is on the adequacy and character of this integration that assessment is based. Now in the confusional state, not only is perception gravely restricted, but the emotional functions which underlie phantasy are themselves

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disturbed. These emotional changes, though often evident in conversation and behaviour, are brought out particularly clearly on the Rorschach test, and may, as we have seen in the present cases, provide an early indication of long-term post-traumatic personality change.

A detailed correlation of our results with the general outcome of Rorschach studies in post-traumatic conditions cannot be undertaken here. But it is in order to comment that features such as a disproportionate number of " poor whole " and " poor form " responses at all stages and the frequency of crude colour responses, repetition and confabulation are in keeping with what has been described in such conditions by earlier authors (Oberholzer, 1931 and 1939; Klopfer and Kelley, 1942, pp. 367–8). On the other hand, we find ourselves unable to report certain traits on which considerable stress has been laid in the Rorschach literature. In particular, we find no significant proportion of *small and unusual details*—a feature of the post-traumatic condition on which Oberholzer in particular lays great emphasis. Indeed, in our experience, this feature has been found in only one of ten records obtained from head-injury patients tested during the acute confusional state, and in a negligible proportion of a much larger chronic post-traumatic material. This discrepancy between our findings and those of Oberholzer awaits interpretation.

It will be remembered that the *frontal areas* of the brain were predominantly involved in both our cases, and it is therefore to be expected that our results will show some affinity with the findings of Piotrowski (1938) and others who have made special Rorschach studies in cases of frontal lobe pathology. This expectation is further strengthened by the poor results achieved by our patients on the sorting tests (*cf.* Section II), since we know that cases with lesions of the frontal lobes are particularly apt to fail on tests of this type (Goldstein, 1936, 1939*a*, 1942; Goldstein and Scheerer, 1941; Trist, 1943). Detailed comparisons would be out of place here, but it may be said with fair certainty that our results correspond in essentials with those already reported in the literature. We would like to refer especially to the case of Pick's disease reported by Piotrowski (1938), in which the Rorschach records are given in full. Yet it cannot be too strongly emphasized that in view of the notorious difficulty in establishing any specific pattern of psychological impairment pathognomonic of frontal lobe dysfunction, any conclusions in the field of cerebral localization must be treated with the utmost discretion.

VII. Summary.

(1) Observations on the Rorschach test in two cases of severe concussional head-injury are described in full. The test was first given during the acute confusional phase, repeated during the subacute (Korsakow) phase, and given finally at an advanced stage of convalescence when residual impairment in cognitive and emotional function had become stationary.

(2) The successive records are presented and some analysis and comment is given in each case. Special attention is drawn to progressive changes in Rorschach performance associated with recovery from the post-traumatic confusional state.

(3) The manner in which dominant emotional reactions influence the content of Rorschach responses is illustrated in both cases. It is pointed out that the character of post-traumatic personality change may be suggested at an early stage by performance on the Rorschach test.

(4) It is pointed out that the results suggest a close relationship between intellectual deterioration as shown on Rorschach performance and failure on " abstraction " tests of the type advocated by Goldstein. This finding has some significance in view of the high level attained by both cases on a number of the verbal and non-verbal intelligence tests in current use.

(5) The relation of the results to earlier studies of post-traumatic conditions and cases of frontal lobe pathology is briefly considered. Some possible applications of the Rorschach method in the study and assessment of organic conditions are also discussed.

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Lastly, I have to thank Miss S. M. Harvey for her able and patient instruction in the Rorschach method, but must make it clear that I alone am responsible for the interpretations set forth in this paper.

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A STUDY OF CERTAIN QUALITATIVE ASPECTS OF PROBLEM SOLVING BEHAVIOUR IN SENILE DEMENTIA PATIENTS.

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1. INTRODUCTION.

RECENT psychological investigations have left little doubt that considerable mental deterioration takes place with advancing age. The work of the United States Army Psychologists in the last war (22), of Beeson (1), Jones and Conrad (10), Weisenburg, Roe and McBride (21), Sorensen (18), Miles (11, 12, 13, 14), Ruch (17), Thorndike (19), Wechsler (20), Gilbert (7), Cleveland and Dysinger (3) and others makes it apparent that not only do the various mental abilities decline with age, but also that they decline at different rates.

In the research work mentioned above two points have not received as much consideration as they would appear to deserve. In the first place it seems reasonable to assume from the differential decline of ability that the way in which these abilities are organized in the mind may be profoundly changed in old age. This view is supported by certain data reported elsewhere (6). In the second place it seems possible that certain qualitative changes may take place with regard to any one of the abilities concerned. Piaget has shown reason to believe that such qualitative changes take place in the *growth* of intelligence; it would seem at least possible that similar qualitative changes may take place in the *decline* of intelligence.

The question of qualitative differences in problem solving has been dealt with most frequently in connection with schizophrenia and organic brain lesions. Reference may be made, for instance, to the work of Goldstein on *abstract* and *concrete* behaviour (8), and Cameron on regression in schizophrenic thinking (2). In his work Cameron touches incidentally on the problem of qualitative changes in the thinking of senile dementia patients, and although no direct conclusions are formulated, his results appear to be in line with those reported in this paper.

While these investigators used sorting tests of one kind or another, such as the Vigotsky Blocks, a standard intelligence test was used in this investigation. This well standardized perceptual problem-solving test was given to over 100 cases of senile dementia, and the scores, reliabilities, errors and various factors determining success or failure on the test items were analysed and compared with similar data from a normal adult sample and a group of children whose average performance was closely similar to that of the seniles.

2. EXPERIMENT.

(a) *Population.*—The population used in this experiment consisted of 100 male senile dementia patients at the Tooting Bec Hospital. A wide variety of professions was represented in the population used: roughly 20 per cent. had been labourers, handymen, carmen and unskilled factory workers, while another 20 per cent. had been highly skilled workers (instrument-makers, engravers, compositors, etc.), had been in business for themselves or had managed shops for others; the

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remainder were either unclassifiable, or had been employed in jobs intermediate between the other two groups. The average age was 73, with a S.D. of 6·5.

(b) *Test.*—The test used was the Progressive Matrices Test in its individual board form, as described by Raven (16, p. 12). In this form the subject is given 24 separate perceptually presented problems, divided into two sets, " A " and " B," each containing 12 problems. Each problem consists of a design or " matrix " from which part has been removed. Six alternative solutions are presented at the foot of the board; the testee has to examine the matrix, and decide which of the pieces given below is the correct one to complete the matrix. The designs are printed in colour and affixed to thick pieces of cardboard so that they can be readily manipulated, and the testee has a chance of seeing how well his proposed solution fits in with the total design. Often several solutions are tried out and rejected before the final acceptance of one.

(c) *Administration.*—The test was given to 100 subjects, and repeated after an interval of approximately three months on 84 (the others being no longer available). As the dullest subjects were very dull indeed it was necessary to make the instructions as simple as possible, and therefore the problems contained in Set " A " were presented as a game requiring *matching*, and the problems in Set " B " as requiring *completing the pattern*. In no case was an error pointed out, but the subjects were praised after each problem regardless of success.

3. Results.

(a) *Scores.*—The average score of the 100 patients tested was 14·5. The average score of normal adult subjects on these 24 problems is 20·7 (9). Thus the seniles solve correctly on the average 6·2 problems less than the normals. By means of Raven's Conversion Tables it is possible to transform these scores into percentiles. When this is done it is found that as compared with the average score of the normals, which is, of course, at the fiftieth percentile, that of the seniles is well below the fifth percentile; thus, on the average, their performance is equal to that of the lowest 3 or 4 per cent. of the normal adult population.

As mentioned above, only 84 patients repeated the test. On the first performance their average score was 14·7 ± 2·9 S.D. On the second performance their average score was 15·1 ± 3·1 S.D. The lowest score was 6, and the highest 20. Even the highest score was, therefore, below the average score for a normal adult population.

In standardizing the Matrix Raven used 26 problems in Sets " A " and " B," 20 of which were identical with those used in the present test. On these 20 problems the average adult score is 17·5; the average score for children of ages 8 ± 1 is 13·4; and for the senile patients it is 12·6. Thus their performance is roughly on a level with 8-year-old children.

Apart from comparing the scores of our group with normal adults and with children, it is possible to compare them with those reported on two psychotic groups, manic-depressive and schizophrenics (4). The relevant data are set out in Table I.

TABLE I.

	Set "A."	Set "B."	Total.
Manic depressive	9·2	6·7	15·9
Schizophrenics	9·7	6·1	15·8
Seniles (average)	9·4	5·5	14·9

In Set " A," the simpler of the two sets, the seniles achieve the same average score as the two other psychotic groups, but they are notably worse in the more difficult Set " B "—a result very much in line with expectation.

(b) *Order of difficulty.*—In Fig. 1 are shown the comparative orders of difficulty for 2,790 normal adults, 104 children of ages 8 ± 1, and the 100 senile dementia patients. The tests are arranged in ascending order of difficulty for the normal subjects.

It will be apparent that despite slight differences the order of difficulty is very similar for these three types of subjects. Rank correlation coefficients were calculated between the three orders of difficulty; these average + 0·95.

The larger differences as between normals and seniles are A5, B2, B8, A12 and

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B12, with the interesting point in addition that the seniles find B10 somewhat easier than either B11 or B12, neither of which in any case was solved correctly except by chance, while in a few cases B10 was understood and even put into words.

The larger differences as between the 8-year-old children and the seniles are A5, B2, B8 and B4. B10 is for the children, as for the seniles, considerably less difficult than B11 or B12. At the end of Set B both children and seniles fall off.

(c) *Reliability*.—The test-retest correlation for the 84 patients who repeated the test was 0·49 ± 0·08.

Raven (15), using the board form of the test but including 26 problems instead of

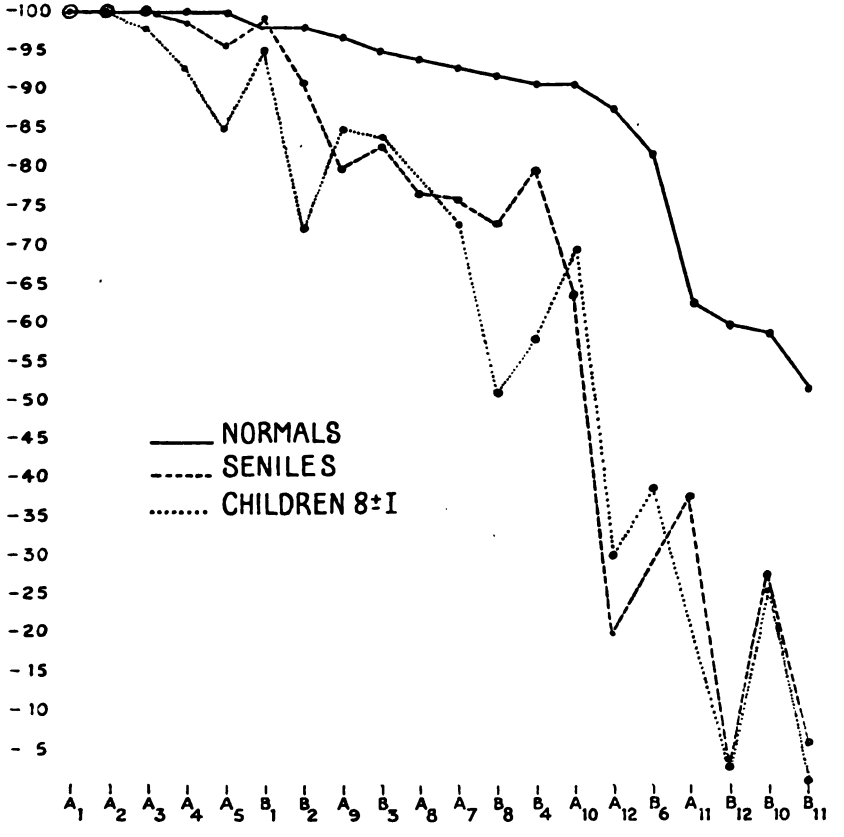

FIG. 1.—Percentage of three groups of subjects passing 20 items of the Matrix Test, arranged in order of difficulty for normal group.

24, retested 56 children between the ages of 5 and 9, and obtained a reliability coefficient of 0·86 ± 0·03. The average score of the 26 problems at the first testing was 14·5 and at the second testing 16·5, with S.D. 4·4 and 4·8 respectively.

The average scores of the seniles were similar, 14·7 and 15·1 for the first and second testings respectively, but with S.Ds. much lower, namely, 2·9 and 3·1. Direct comparison of the reliabilities, therefore, does not give a fair indication of the comparative accuracy with which these two groups of subjects are tested by the Matrix. The age range from 5 to 9 covers a period of great mental development, while the senile patients were all old and in nearly every case suffering from exaggerated senility, hence our population is much less heterogeneous than the children.

It is possible to estimate the reliability which would have resulted if 60 problems could have been used (as in the whole Matrix) instead of only 24 problems. Using the Spearman-Brown prophecy formula the corrected reliability would be 0·706. This is not very much below the reliability found for normal subjects when the

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whole Matrix is used, and this agrees well with H. J. Eysenck's finding that neurotics are less, but not *much* less, reliably tested by the Matrix than are normals. He found test-retest reliabilities of 0·87 for normals and 0·81 for neurotics (5).

(d) *Analysis of errors:* (i) *Comparison with normals.*—Halstead (9) gives the most frequent errors made by 2,790 normal subjects, and I am indebted to him for his kindness in providing me with the exact number of subjects selecting each of the six possible blocks for the tests in sets "A" and "B."

As has been stated previously in Section (b), the *order of difficulty* for normals and seniles shows only slight disparity; what is of interest here is to compare the *type of error* the two groups make. Accordingly, in the following table the most frequent error made by the normal subjects is shown for each problem, together with the percentage of *those making an error on the particular problem* who solve it incorrectly in this way; the most frequent error made by the senile subjects is similarly shown, with the percentage of seniles making an error on the problem who solve it incorrectly in the way indicated. In three cases two designs were chosen incorrectly with the same frequency, and both block numbers are given.

TABLE II.

	Most frequent error made by normals.	Percentage of errors accounted for.	Most frequent error made by seniles.	Percentage of errors accounted for.
A 1	—	—	—	—
2	—	—	—	—
3	(2) (3)	50 50	(3) (4)	50 50
4	(3)	67	(3)	86
5	(2)	43	(3)	33
6	(2)	37	(1)	50
7	(4)	64	(2)	48
8	(6)	48	(6)	42
9	(5)	61	(5) (6)	40 40
10	(6)	56	(6)	46
11	(1)	43	(6)	45
12	(6)	52	(2)	41
		—		—
Average per cent. making most frequent error		52		48
		—		—
B 1	(1)	57	(6)	50
2	(2)	46	(2)	60
3	(2)	70	(2)	81
4	(4)	74	(4)	71
5	(5)	76	(5)	63
6	(2)	78	(2)	36
7	(6)	48	(2)	44
8	(2)	44	(2)	53
9	(1)	62	(1)	76
10	(1)	41	(1)	50
11	(3)	38	(3)	56
12	(2)	39	(2)	66
		—		—
Average per cent. making most frequent error		56		59
		—		—

For the 22 problems on which errors were made, the most frequent error is identical in 15 cases. Also, the percentage of each group who choose the most popular error is very similar; roughly just over one-half of the errors of each group agree with the most frequent of that group.

From the high amount of agreement between the groups on the incorrect block chosen it is not to be expected that any important findings will emerge showing fundamentally different mental processes at work which influence the senile patients in solving this type of test. The first disagreement comes in A5, where the seniles

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select block (3), which is a single design of the correct pattern instead of the all-over design; the normals, on the other hand, pick block (2), which is an all-over design but contains no element of the correct pattern.

In A6 the disagreement is far from great: 37 per cent. of the normals who make a mistake on this one select block (2), and actually a higher percentage of the seniles chose that block as well, namely, 38 per cent. However, 50 per cent. of the seniles pick block (1), whereas it is chosen by only 18 per cent. of the normals.

A rather larger difference is apparent in A7, 48 per cent. of the seniles selecting block (2) and only 15 per cent. of the normals; while block (4) is favoured by 64 per cent. of the normals and 26 per cent. of the seniles.

The next discrepancy is in A11, where 43 per cent. of the normals but only 19 per cent. of the seniles chose block (1); and 45 per cent. of the seniles and 34 per cent. of the normals pick block (6).

The percentages for A12 are 52 per cent. of the normals, and 36 per cent. of the seniles select block (6), while 41 per cent. of the seniles and 15 per cent. of the normals prefer block (2).

In Set "B" there are only two cases of disagreement on the favourite error, namely, B1 and B7. So far as B1 is concerned, little weight can be given to the disagreement, as in all only 2 per cent. of the normals and 4 per cent. of the seniles made an error in the solution. In B7 48 per cent. of the normals select block (6) and only 6 per cent. of the seniles prefer it; 44 per cent. of the seniles and 17 per cent. of the normals choose block (2). This is, perhaps, the most interesting disagreement, with the seniles' choice being straight matching of the design above, whereas the normals' consists in realizing at least that the block to be supplied must in some way be similar to the odd one of the three patterns given.

Especially when it is recalled that the normals did the Matrix test as a group test, whereas the seniles were given the individual board form, it would appear that no outstanding differences appear in the type of error made. As the next section will indicate, it seems to be the position of the blocks rather than the particular design of them—except, of course, the *correct* design—which influences both types of subjects in selecting them.

(ii) *Importance of position of block.*—For those not familiar with the lay-out of the test items, it may help to indicate the general picture of each test as presented to the subject. He has at the top of the board (or page, as the case may be) an incomplete pattern with a space left blank to be filled in from the blocks shown at the foot. These are numbered in the case of the group test, and the same numbering was used in recording the seniles' choice on the individual board test. The position of the different numbers is as follows:

(1) (2) (3)
(4) (5) (6)

From watching the seniles attack the test, it appeared fairly obvious that certain positions of the blocks were more favoured by them than were others. Table III gives the percentage of errors in which each position was used, and also the same information with regard to the errors of normals.

TABLE III.

Seniles: *Percentage of Errors in which each Number was Used.*

	(1)	(2)	(3)	(4)	(5)	(6)
Set "A" .	20	22	8	11	6	33
Set "B" .	22	36	15	9	9	9
Average .	21	29	11·5	10	7·5	21

Normals: *Percentage of Errors in which each Number was Used.*

	(1)	(2)	(3)	(4)	(5)	(6)
Set "A" .	30	9	3	18	4	36
Set "B" .	23	30	14	7	13	13
Average .	26·5	19·5	8·5	12·5	8·5	24·5

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Spearman's Rank Coefficient of Correlation between these two averages is 0·71, and as can be seen by inspection, the only large difference appears in the case of position (2), which is considerably more popular with the seniles than with the normals.

(iii) *Errors due to "matching."*—Commencing with problem B4, a marked tendency was observed for the subjects to "match" either the design above the blank space or the design to the left of it. It is interesting to find that the same tendency was evident in the normals. In the case of B8 the correct solution is given by matching the design above, so that test is not included in the summary below in Table IV, which indicates the relative strength of these two sources of error.

TABLE IV

	Percentage of errors due to matching design above.		Percentage of errors due to matching design to left.		Percentage of errors due to one or other of these.	
	Normals.	Seniles.	Normals.	Seniles.	Normals.	Seniles.
B4	74	71	15	21	89	92
B5	76	63	11	26	87	89
B6	78	36	5	25	83	61
B7	17	44	27	21	44	65
B9	62	76	33	15	95	91
B10	41	50	37	34	78	84
B11	38	56	32	33	70	89
B12	39	66	23	12	62	78
Approximate averages	53	58	23	23	76	81

Thus, 81 per cent. of the errors made by the seniles are accountable for by either of these two processes, and in the case of the normals only a slightly lower percentage.

(iv) *Error on same test in repetition: Identical Errors.*—The Matrix Test was given to 84 of the senile patients for the second time about three months later, the method and encouragement being the same as before, and care being taken also to see that the test was given to each patient at the same time of the day as on the first occasion.

On the first testing these 84 subjects made 227 errors altogether in Set "A," or 22·5 per cent. error; on the repetition they made 203 errors, or 20·1 per cent. On Set "B" there was a similar slight improvement on the repetition: 552 errors the first time, 540 the second, or 54·7 per cent. and 53·6 per cent. error respectively.

The total errors on the two Sets, therefore, decreased on the second giving from 779 to 743, or a decrease from 38·6 per cent. to 36·9 per cent.

Of the 430 errors made in Set "A" on the two trials, 168, or 39 per cent., were on different items, i.e. the subject solved an item correctly in one case and incorrectly in the other. 61 per cent. of the errors were made on the same items, i.e. the subject gave a wrong solution both times. 28 per cent. of the total errors were identical both times, i.e. the *same* incorrect solution was given both times. Of the errors made on the same items, approximately 46 per cent. were identical both times.

In Set "B" there was a total of 1,092 errors made on the two trials, of which 212, or 19 per cent., were on different items and 81 per cent. on the same items. Here 45 per cent. of the total errors were identical both times, and 56 per cent. of the errors made on the same items were identical both times.

The figures for the two sets combined show that 25 per cent. of the errors were on different items, 75 per cent. on the same, with 40 per cent. of the total errors being identical both times. Approximately 54 per cent. of the errors on the same items are identical errors.

This last percentage gives a good indication of the large element of chance error entering into the solution of this type of problem, at least for these senile patients. As the improvement on the repetition is comparatively slight, the figure of 25 per cent. of the total errors being on different items, with the subject's solution being in one case right and in the other wrong, also suggests a high degree

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of unreliability, which is, of course, borne out by the rather low reliability coefficient mentioned earlier of 0·49.

(e) *Blocks tried out and rejected : perseveration.*—In the preceding subsection the blocks selected incorrectly were discussed ; in this subsection the blocks picked up but finally rejected as unsuitable are analysed.

The 100 patients on their first testing tried out and rejected a total of 830 blocks, 491 in Set " A " and 339 in Set " B." In other words, on the average each patient picked up and rejected 8 blocks during the solution of the 24 problems. Record was kept of only those blocks actually picked up. Many of the subjects would place their hand on a block, but discover it unsuitable before actually moving it, and this type of " mental " trying-out was not scored.

The blocks involved in try-outs are shown in the following table :

TABLE V.

	(1)	(2)	(3)	(4)	(5)	(6)
Set " A " . .	72	61	89	86	48	135
Set " B " . .	57	94	38	45	44	61
Total for each block position	129	155	127	131	92	196

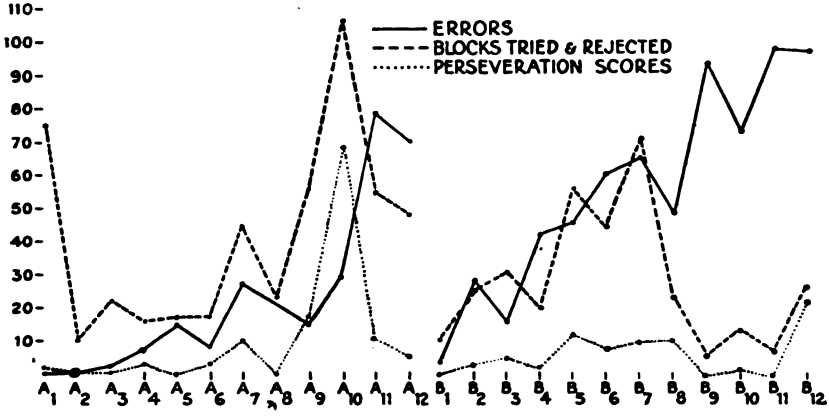

FIG. 2.—Scores of senile dementia patients on Sets " A " and " B " of the Individual Matrix Test.

It is interesting to compare this table with Table III, which shows the percentage of errors in which the different block positions were involved. In both cases position (2) is popular, but here it yields first place to position (6), which lay immediately by the subject's right hand and so was the easiest to pick up and try out, on the offchance that it might be the correct one. As before, position (5) is least popular.

It was noted that some of the senile patients would pick up a block, try it in the matrix, then decide it was incorrect and replace it in its position at the foot of the board. (This replacing was carefully insisted upon.) Then, either immediately, or after subsequent trials and rejections of other blocks, he would again try-out the same block, being in most cases completely oblivious of the fact he had already seen it in position in the matrix and not liked it. As a few subjects repeated the tryout of the same block not once but several times, the following method of scoring was used to weight the scores : a perseveration score of 1 for the first repetition, 2 for the second, 4 for the third ; 8 for the fourth, etc.

On the first testing 30 of the final 84 subjects earned perseveration scores ; on the second testing 34 subjects. Only 15 subjects got this score on both occasions. The average perseveration score on the first testing was 1·52 ; on the second testing 1·33 ; S.Ds. 4·8 and 2·94 respectively. The reliability coefficient was only 0·11, which is not statistically significant. Those who received perseveration scores did no worse on the test than those who were not guilty of this " forgetfulness."

Fig. 2 shows for each of the 24 test items three variables : number of errors in

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final selection ; number of blocks tried out but finally rejected in favour of another ; " perseveration " scores.

From Fig. 2 a number of points of interest can be observed. As would be expected, the perseveration score follows fairly closely the number of blocks tried and rejected. Also the number of errors made is in moderate agreement with the other two scores. A1 is an exception to this, for to ensure that the subject really understood the test it was necessary to keep him at this first problem until he solved it correctly. A10 presented great difficulty to these subjects, as shown by the number of trials made, but there were many more ultimate successes on it than on the following two items. The other wide divergence between number of errors and rejected try-outs appears at the end of Set " B," where a good many subjects remarked that these were really easy, and happily fitted a block matching the one above or beside the space, in spite of reiterated instructions that the correct piece need not *match*, but that they were to complete the pattern in the best possible way so as to make a good, balanced design.

(f) *Timing*.—The first performance of the test was not timed ; but on the repetition it was decided to time the test to the nearest half minute. The subjects were told that accuracy was all-important, and no special attention was drawn to the presence of the stopwatch, which was left at the side of the table and started as soon as the preliminary instructions had been given and understood.

The time taken by the 84 subjects ranged from 5 to 51 minutes, with an average of 9·9 minutes, S.D. 6·12.

Of the 84 subjects retested, 78 were tested for the third time about four months later. On that occasion the time ranged from 4 to 29 minutes, with an average of 10·2 minutes. The average for these same 78 patients on the first repetition was 9·8 minutes, so contrary to what might have been expected, they actually took slightly longer on the average to do the test the third time than the second.

Halstead mentions a slight tendency for times to increase with age, and says, " There is also a slight but insignificant tendency for a wider variation in test times to occur in the ' over 30s '."(9) The results given here cannot be compared directly with his, as he was using the full Matrix Test given as a group test ; but they do seem to bear out his findings.

The correlation between the length of time taken and total score on Set " A " and " B " was calculated and found to be $-0{\cdot}156 \pm 0{\cdot}108$. Thus, there is a slight, non-significant tendency for accuracy and speed to be related positively for these senile patients.

4. Summary and Conclusions.

A special comparative study was undertaken of 100 senile dementia patients regarding scores, reliabilities, errors and various factors determining success or failure on 24 perceptual problems. This analysis was carried out in an effort to discover whether, in addition to the frequently observed quantitative changes which take place in intelligence with increasing age, qualitative changes could also be observed. Comparisons were carried out on various points between the experimental population on the one hand and samples of normal adult, normal child, schizophrenic and manic-depressive populations on the other.

The performance of the senile dements was roughly on a level with that of 8-year-old children ; it was slightly worse than the performance of manic-depressives and schizophrenics, and was approximately equal to that of the lowest 3 or 4 per cent. of the normal adult population.

As regards order of difficulty of the problems considered, no appreciable differences were found between groups of 2,790 adults, 104 children of ages 8 ± 1, and the group of 100 senile dementia patients, the orders correlating on the average 0·95.

As regards the test-retest reliability of the group of problems, it was found to be below the reliability found for normal subjects.

As regards the most frequent errors made, it appeared that there were no outstanding differences between normals and senile dementia patients. The position of the blocks was shown to be of importance in determining the errors made ; this was true for normals and seniles alike. A marked tendency was observed for the subjects to match either the design above the blank space or the design to the left

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of it. This tendency accounted for 81 per cent. of the errors made by the seniles. The same tendency was evident in the normal subjects, where it accounted for 76 per cent. of the errors.

The time taken over the test was considerably longer than with normal subjects averaging 9·9 minutes, and very large differences were found among the subjects. This bore out a slight tendency previously found by other investigators for times to increase with age, and for wider variation in test times to occur in the older groups.

The above results all seem to point to the conclusion that while there is a considerable deterioration quantitatively in the senile patients, they do not differ qualitatively from the children and normal adults with whom they were compared. With regard to the types of error made, the reasons for these errors, and the order of difficulty of the problems, senile dementia patients agree so closely with normals that we must come to the conclusion that qualitatively identical ability is being tested throughout. While the data are derived from only one test, and can, therefore, not be regarded as definitely settling the problem of the existence or non-existence of qualitative differences in senility, they do show that with regard to one mental function at least the existence of such differences is more than doubtful.

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AN EXPERIMENT IN MENTAL TESTING DURING HYPNOSIS.

By GERTRUDE KEIR, M.A.

[Received February 2, 1945.]

THIS paper describes the case of a girl to whom certain mental tests were given while she was under hypnosis. The results of these tests are compared with the results obtained when she was in her normal state.

Case History.

The patient was a girl, aged 17, admitted to the Maudsley Hospital on April 1, 1938. The informant with the patient (her employer) reported attacks of sleep-walking occurring spontaneously between eleven and twelve at night. During these attacks the patient would get up from bed, put on a dressing-gown and wander about the house, her eyes open, her movements perfectly co-ordinated and her behaviour quite purposeful. She would imagine that she was back at school, and address those who spoke to her as her teachers. The total situation would be fraught with some anxiety; she would look for her gym. shoes, her attaché case, or an exercise book in which to write her detention lines. On two occasions she had done the household ironing and done it very well. When roused, which took some time, she would look bewildered and ask where she was. On waking in the morning she seemed almost completely amnesic for the episode. The extent to which her memory functioned is doubtful, since it is possible she built up some knowledge of what she had done from the questions put to her by her employers.

From the social worker's report the following history was elicited: The patient was the first and illegitimate child of a feeble-minded servant girl of 15, who was forced to leave her first job owing to this pregnancy. Of the father, nothing is known; he is thought to have been a coloured seaman, as the patient's appearance was strongly suggestive of coloured blood. She was deserted by her mother at the age of six months, and was subsequently brought up in two orphanages, leaving the first at the age of six years and continuing in the second until, at the age of sixteen years, she obtained employment as a domestic servant.

Sleepwalking began within a month of going out to this job, which she had to quit for this reason at the end of five months. She obtained another domestic post, but the attacks increased in frequency, until they were occurring as often as three times a week. At this point, after ten months' service in this house, her employer referred her for treatment.

The social history showed no evidence of previous mental or nervous illness, the health of the patient having been good save for a mastoidectomy at seven years, which had resulted in a left facial palsy.

On the personality of the patient varying judgments were passed. The school report said she was capable and interested in her work, but the ringleader in various misdeeds. For this reason she had not been permitted to sit for a trade scholarship at the age of thirteen years. This had been a great blow to her, since she was very ambitious and wanted to be a journalist.

In her first post she was "uncertain in her wórk, careless and given to moods," and was given notice within the first few weeks. Her work improved so much, however, that she was kept on, being subsequently discharged for the sleepwalking. She was very happy in her second post, where her employer described her as pleasant, although sometimes dreamy, careless and irresponsible. She was, however, very kind and careful with the children. She had no boy friends, and only a few girl friends from her school, but with these she got on well. Her employer stated that

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she was not of a worrying or anxious disposition, but that she did appear to worry over the circumstances of her birth, fearing that she might be illegitimate, and had sometimes discussed the position with her mistress.

The employer had no desire to lose her, but the inconvenience and possible danger of these frequent attacks, as well as a wish to help the girl, made her feel treatment was essential. She was therefore admitted to the Maudsley Hospital, where she remained for three months.

Behaviour in Hospital.

There were no attacks of sleepwalking while she was in hospital. On one night only did she call out in her sleep, addressing the nurse by the name of her school teacher. She retained no recollection of this the next morning. She was pleasant, co-operative, and on good terms with staff and other patients. She was under the care of Drs. W. Sargant and A. Sinclair, who could find no serious abnormalities of thought, mood or behaviour, though she was clearly a hysterical personality. Her insight was good. She realized her worry over the circumstances of her birth and the nature of her employment and discussed them in a reasonable way. She was easily hypnotized, and during these periods she would fancy herself to be a schoolgirl of thirteen years, back at school and talking to a teacher. No stereotyped behaviour, as in sleepwalking, took place on these occasions, her underlying anxiety apparently being satisfied through the medium of speech. After such conversations, during which her fears and ambitions were discussed, she would, when in her normal state, report that she felt herself easier in her mind about such matters, although she retained no recollection of her conversations while under hypnosis.

A month after her admittance to hospital she was given a routine psychological examination, using the Binet test (Terman Merrill), the Rorschach and a Word Association Test. It was then decided, as a matter of interest, to test her under hypnosis. The three tests were therefore repeated some three weeks later. A few questions of general knowledge were also given her.

While under hypnosis there were slight but definite alterations in attitude and manner. In her normal state she was " Miss Brown " and her manner was definitely grown-up. Under hypnosis she gave her name as " Barbara," and treated it as a joke if she were called Miss Brown. She seemed less independent, more desirous of praise, and spoke with the slight deference of a school girl towards her teacher. At the same time her flow of conversation was easier, and her mood less settled. On one occasion she became irritable and the test had to be stopped. As " Miss Brown " her mood throughout was friendly, co-operative and interested. Under hypnosis she appeared to retain no memory of the tests which had been administered to her in a normal state.

Results of Psychological Tests.

It is not proposed to give here the substance of the many conversations held with her when under hypnosis. The tenor of her speech showed the constellation of knowledge relevant for a girl of thirteen years in the year 1934. Of all events, both in her private life and in public affairs, which had taken place since 1934 she seemed, when under hypnosis, to be totally unaware, e.g. her periods did not start until she was sixteen. When hypnotized she appeared to have no real knowledge of the fact of menstruation, although she said that girls at school had dropped hints about it. Unfortunately, lack of time prevented the administration of educational tests, which might have brought out differences in attainment, due to two years' extra schooling.

She was given some few simple general knowledge questions. The answers she gave when under hypnosis show the differences mentioned. She was asked to give her name, the date, her age, the place she was in, the person she was addressing, the name of the King, Queen, and Prime Minister. To all these questions she returned correct answers when in her normal state. Under hypnosis, however, her name was always Barbara Brown, as contrasted with Miss Brown at other times ; the date was invariably October 15, 1934 ; place, the school. It is interesting to note here the facility with which she fitted the hospital surroundings into the pattern. When discrepancies in type of room and furnishing were pointed out to her, she

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would look round thoughtfully and suggest variously that we were in the staff room, the clinic, the sick bay and so on, without, however, linking these suggestions up to any general situation which might account for her presence in such places.

The name of the King, Queen, and Prime Minister were always given as George V, Mary, and Baldwin. Her talk was all of school friends and school events. At no time did she give a response which was inconsistent with what was presumably her state when she was actually thirteen.

The Binet Test.

In her normal state she was given both Form L and Form M. Under hypnosis she was given Form M first, and about ten days later Form L was administered. Unfortunately she was then in a restless and unsettled mood, with poor concentration and indifferent co-operation, and the results are of poor value for this reason. It was hoped to give her Form L at some further date, but owing to pressure of work on the part of the examiner this was not done. The comparison between the two sets of answers, in the normal and the hypnotized states, will therefore be made on the results of Form M.

It is now generally conceded that the concepts of Mental Age and Intelligence Quotient are beset with difficulties, particularly in respect to adults, and that their place should be taken by estimates of percentile ranking or S.D. Nevertheless, they are so generally known that it would be absurd not to give them here.

On " Miss Brown's " test the Mental Age was 16 years 5 months, I.Q. 109, " Barbara's " Mental Age being 14 years 5 months, I.Q. 96. There is, therefore, evidence of loss of efficiency in intellectual functioning during hypnosis in the case of this subject. It is a somewhat curious coincidence that this lowering in intellectual functioning should correspond so closely to the imagined difference in chronological age at the time of the second test. Had " Barbara " in reality been 13 years 10 months (her age in October, 1934), her M.A. of 14 years 5 months would have yielded an I.Q. of 106, very similar to that of " Miss Brown."

The scatter in " Barbara's " results was of the sort often given by emotionally disturbed patients, extending over eight years (10 years, S.A.11—a single success at the latter level). With this is contrasted the more stable performance of " Miss Brown " with a range of five years (13 years, S.A. 11).

The type of tests on which success and failure occurred show a definite consistency.

(a) *Verbal Tests.*

Both sets of answers show success in tests of a more purely verbal nature. The vocabulary and abstract word scores do not differ. This is not surprising, as verbal facility is least likely to be affected by interference, except in cases of specific verbal disfunctioning.

(b) *The So-called "Social" Tests.*

There is little difference in the results on these tests, both passing on the Absurdities and Problems of Fact on the same level, " Barbara " however failing on the Ball and Field.

(c) *Memory Tests.*

Slight, but probably not significant, differences emerge here. Repetition of digits backwards was constant for both at six digits. " Barbara " could not repeat more than six forward, while " Miss Brown " scored a success at the level of eight. On meaningful material " Barbara " failed to pass the story at the 13-year level, on which " Miss Brown " succeeded. This slight disparity was not followed up by other tests of auditory memory, both formal and meaningful, owing to lack of time.

(d) *Tests of Reasoning.*

The most noticeable difference occurred in " Tests of Reasoning " with abstract thinking. The scores are as follows :

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Test.		"Miss Brown."	"Barbara."
Similarities	(11 year)	Not given.	Failed.
Reasoning	(14 year)	Passed.	Passed.
Orientation	(14 year)	,,	Failed.
	(A.A.)	,,	,,
Ingenuity	(14 year)	,,	Passed.
	(A.A.)	,,	Failed.
	(S.A. 11)	,,	Not given.
Reconciliation of Opposites	(14 year)	Failed.	Failed.
	(S.A. 11)	,,	,,
Differences	(A.A.)	Passed.	,,
	(S.A. 11)	Failed.	,,
Proverbs	(A.A.)	Passed.	,,
	(S.A. 11)	Failed.	,,
Codes	(A.A.)	Passed.	Passed.
	(S. A. 11)	,,	,,

" Miss Brown " succeeded on ten out of fourteen tests administered, " Barbara " passed on four out of fourteen. The disparity is striking. Although " Barbara " scored successes on this type of test at A.A. and S.A. 11 level, these were solitary successes against a background of failure ; the type of successes found where there is unevenness of functioning. Contrasted with this is the more stable picture of success and failure given by " Miss Brown."

When hypnotized, therefore, this subject experienced difficulty in abstract thinking, and in the working out of general principles, the whole level of thought being reduced to a more concrete and childish level.

The organization and control of thought being less effective, the possibility of the emergence of emotional and conative elements suppressed in ordinary circumstances was considered. It was with a view to finding out whether such elements did emerge to alter the balance of personality that the Rorschach test was given.

Result of the Rorschach.

The records for this test were taken by the psychologist. They were then sent for analysis to a psychiatrist, Dr. Earl, who knew nothing of the history save that both came from the same subject. His report reads as follows :

" There is no essential difference in personality brought out by hypnosis. Both sets of answers show traces of neurotic shock, anxiety and emotional construction. In neither is there any indication of good intelligence, organizing ability being low."

(This indicates the extent to which emotional factors can interfere with the picture of intelligence obtained through the Rorschach, since the intelligence of the patient was undoubtedly normal.)

The main difference brings out " the rather painful conscious control of ' Miss Brown ' as contrasted with the less inhibited, but more unhealthy, approach of ' Barbara.' In ' Miss Brown's ' record there was evidence of much repressed affect, showing a person who was adjusting, or trying to adjust, by rigid conscious control of her mental processes and avoiding anxiety by the undue affective constriction."

How deep this affective constriction goes is brought out more clearly when we look at the results of the Word Association Test. We should expect to find certain differences present between the two sets of results, due to the differing degrees of control exerted by the subject. This is what we do find. Let us examine the ways in which these differences are manifest.

(1) *Reaction Time.*

To the Kent-Rosanoff list of 100 words were added six extra words, thought likely to possess special significance for this subject : marriage, unlawful, work, colour, dark, mother.

These were given at intervals throughout the original list. The reaction times are therefore given for 106 words.

The difference between the two sets of reaction times brings out clearly the

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extent of the control exercised by " Miss Brown " in her everyday life. The first comparison is for responses actually given. " Miss Brown " failed to reply to ten stimulus words, " Barbara " to three. For the 96 and the 103 replies given the times were as follows :

	" Miss Brown."	" Barbara."
Total reaction time	591·7 secs.	382·4 secs.
Mean reaction time	6·2 ,,	3·7 ,,
Medium reaction time	4·2 ,,	3·1 ,,

It will be seen that repression of painfully toned ideas is very great in " Miss Brown," both her mean reaction times and medium reaction times being two to three times as long as in a normal subject. Hypnosis is able to effect the loosening of this repression to a considerable extent, although in " Barbara " we still find that both mean and medium reaction times are one second over normal.

The second analysis of reaction times shows this even more strikingly. Here the times taken over the whole list are compared, failures included, 106 in each case. Thirty seconds was allowed for a reply to a stimulus. If none was forthcoming at the end of that time, the word was repeated and a further 10 seconds allowed. Thus a failure was said to occur at the end of 40 seconds. The table below shows the time taken by both over the whole list :

	" Miss Brown."	" Barabara."
Total reaction time	991·7 secs.	500·4 secs.
Mean reaction time	9·3 ,,	4·7 ,,
Medium reaction time	5·0 ,,	3·1 ,,

Here the control is seen to go so deep that even under hypnosis it is exerted to a pathological degree.

Over 10 per cent. of " Miss Brown's " replies took longer than 10 seconds, as contrasted with 3 per cent. for " Barbara." The range in variation is extreme for " Miss Brown," " comfort " being responded to only at 40 seconds, while " black " elicited a reply at ·4 sec. The range is still great for " Barbara " but more of it within normal limits, " citizen " being responded to at 16·3 secs. and " long " at ·4 sec.

(2) *Failure of Response.*

While " Barbara " fails to reply on 2·9 per cent. of the stimuli, " Miss Brown " gives no reply for 9·4 per cent. Jung gives the norms for failure as 1·9 per cent. for educated, and 1·2 per cent. for half-educated women. It is seen how gross is the proportion of " Miss Brown's " failure. The following table shows the failure in the two sets of responses :

Word.	" Miss Brown."	" Barbara."
profound	No reply.	Deeply—4·0 secs.
wish	,,	Well—9·1 secs.
trouble	,,	No reply.
dream	,,	Thought—8·2 secs.
dark	,,	Light—2·3 secs.
quiet	,,	No reply.
religion	,,	,,
light	,,	Shade—2·3 secs.
foot	,,	Hand—3·2 secs.
girl	,,	Boy—0·4 sec.

Certain constellations of ideas and emotions are seen to be still active even under hypnosis. The inclusion of " marriage " and " unlawful " in the list was justified by the delay in "Miss Brown's " responses, the first word evoking " bride " at 21 seconds, the second " wrong " at 16 seconds respectively.

So far we have had a picture of a very profound emotional repression, operative to some extent even under hypnosis. Are there any changes in the type of responses which would enable us to pass any judgment on variations in personality, as revealed

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under hypnosis? If the amount of repression exercised under hypnosis becomes less and in consequence the repressed elements are allowed to emerge more freely than in the patient's normal state, does this variation affect the balance of personality—taking personality in the Jungian sense of introvert-extravert types? Should alteration in the balance of personality take place we might expect that this would affect the types of responses given in the two sets of answers. This is, on analysis, shown not to be the case, substantiating on this point the evidence of the Rorschach test.

(3) *Types of Responses.*

Thirty-three answers were identical in both. The responses which differed have been analysed in accordance with Jung's classification of responses. The percentage of each type has been taken from the number of differing responses in each set of answers (63 responses for "Miss Brown," 70 for "Barbara").

	"Miss Brown."	"Barbara."
1. *Inner Association.*		
Co-ordination	11·1%	28·8%
Prediction	17·5 ,,	8·6 ,,
Causal relation	9·5 ,,	2·8 ,,
	38·1%	40·2%
2. *Outer Association.*		
Co-existence	12·7%	5·6%
Identity	11·1 ,,	17·1 ,,
Verbal motor	9·5 ,,	18·5 ,,
	33·3%	41·2%
Word completion	7·9%	10·0%
Clang	0·0 ,,	0·0 ,,
Rhyme	0·0 ,,	0·0 ,,
Indirect	12·7 ,,	8·6 ,,
Meaningless	4·8 ,,	0·0 ,,
Repetition	3·2 ,,	0·0 ,,

In both sets we see that there is no very significant difference in the relationship between the inner and the outer types of associations. The relative proportion of inner to outer is somewhat unusual, but is found in both sets of answers. Within these two main categories we find certain differences between "Miss Brown" and "Barbara" in the frequency with which subclasses of responses occur, but these differences do not affect the picture as a whole.

In one way, however, the two sets of answers differ strikingly. Those of "Miss Brown" contain twice as many indirect and meaningless associations as those of "Barbara." Since these types of responses denote active egotism, it might be assumed that the control commonly exercised by "Miss Brown" is responsible for this increase.

We may say that the Word Association Test brings out the extent of the control exerted in the repression of emotional factors when this patient is in a state of normal consciousness, and shows, too, the extent to which this control is loosened under hypnosis.

Summary and Conclusions.

This paper describes the case of a female, aged 17, referred to the Maudsley Hospital for persistent sleepwalking, during which stereotyped behaviour patterns occurred. She presented no general serious abnormalities of thought, mood or behaviour, although she was clearly a hysterical type of personality.

While in hospital she was tested, both in her normal state and while under hypnosis, with three different types of test—the Binet, the Rorschach, and the Word Association Tests.

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The results showed that under hypnosis there was a lowering of intellectual functioning, the whole level of thought being reduced to a more concrete and childish type. Generalizations on the basis of this particular case would, however, be unreliable, since its integral feature is the regression to the patient's 13-year-old existence.

Under hypnosis it was possible to verify by an experimental approach the working of generally accepted psychological mechanisms, and to make estimations of the extent to which these were operative. The repression exerted by this patient in normal life was experimentally assessed by means of the Word Association Test, and was shown to be highly abnormal. Under hypnosis the degree to which this repression altered was found to be still abnormal, although considerably nearer the norm. In view of the fact that repression was still present to a significant degree, it is perhaps not surprising to find that, although the patient made a certain amount of progress, sleepwalking again occurred in 1940. While so-called "reason" allowed her to discuss her difficulties in a sensible and quite intelligent way, her main emotional and conative drives were centred around ideational constellations so powerfully toned that even under hypnosis they had still to undergo repression.

As psycho-therapy is being more and more practised on patients in a quasi-hypnotic state, might it not be possible, by the administration of Word Association Tests during such states, to determine the degree to which repression is still being exerted? By carrying out a series of such tests at intervals during treatment, it might be possible to make an assessment of how far the therapy is likely to be ultimately successful.

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FURTHER STUDIES ON THE MODIFIED TAKATA REACTION (M.T.R.) ON THE CEREBROSPINAL FLUIDS OF NEUROLOGICAL AND PSYCHIATRIC PATIENTS.

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PART I.—COMPARISON BETWEEN THE M.T.R. PLOTTED AS A "TIME-CURVE" AND THE LANGE TEST.

Ucko (1935) showed that the reaction time of the Takata test on serum can be reduced from 24 hours to 90 minutes by modifying the concentration and volume of the reagents.† These reagents were applied with a further slight modification in the amount of the fluid tested and as a one-tube method for cerebrospinal fluid (Fleischhacker, 1938). 177 cerebrospinal fluids were examined, and the conclusion was drawn that the M.T.R. will indicate even very fine disturbances in the protein composition of cerebrospinal fluid. Later the test, together with others, was applied to another 165 C.S.Fs. from neurological and psychiatric patients and was found to give weak positive results in many psychoses of the so-called "non-organic" type (especially typical schizophrenics), while it remained negative in manic depressives and neurotic disorders (Fleischhacker, 1943).

Although attention had been drawn to the importance of the time factor in the development of the reaction in the previous papers, no attempt had been made then to plot the development of the turbidity as a time curve and to compare this with the Lange test.

A systematic study on this subject has now been made, and the results obtained are described in the first part of this paper.

MATERIAL, TECHNIQUE AND RESULTS.

The material used in this section consists of 122 cases, most of them of "organic" origin, i.e. of active neurological processes.

Besides the M.T.R. and Lange test, total protein, Nonne and Pandy, cell count and Wassermann and Meinicke estimations and tests have been made. With the exception of Wassermann and Meinicke, all tests have been carried out on fluids not more than two hours old.

Techniques.

(a) *Cell Count.*

A Fuchs-Rosenthal counting chamber has been used and 3 c.mm. have been counted. The results have been expressed as Cells/3. The cells were always given sufficient time in which to stain thoroughly and to settle down in the chamber.

(b) *Nonne.*

The Ross-Jones modification (ring test) was used and readings were made after 3 minutes. The reaction was made by allowing a volume of saturated

* Paper read at the South-Eastern Divisional Meeting of the R.M.P.A. at Shenley Hospital on October 10, 1944.

† This serum test is now known as the "Ucko Test" (for details see Ucko [1942]).

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ammonium sulphate solution to run through an equal volume of C.S.F. and to collect as a layer beneath the C.S.F.

(c) *Pandy.*

One drop of C.S.F. was added to 1 c.c. of 10 per cent. aqueous phenol placed in a small tube. The tube was shaken after 10 seconds and the readings made. The tube was kept for a further 1 hour for other purposes.

(d) *Total protein.*

The turbidometric method of precipitating the proteins with salicyl-sulphonic acid and comparing with a set of standards was used. The error possible in this rough method is usually accepted as ± 3–4 mgm. per 100 c.c. in the lower concentrations.

(e) *Lange.*

A commercial aurosol has been used. Its sensitivity has been checked by controls with sodium chloride solutions of different strengths and by the results obtained with fluids of known diagnosis. It was also checked from time to time with " home-made " sols. The C.S.F. dilutions ranged from 1 : 10 to 1 : 5120 in serial dilutions. The control tube was compared with each individual tube of the test and the individual tubes were compared with each other. All comparisons were made against a white background.

If the Lange test is read in the manner described, weak positive results, i.e., small changes in colour, are not overlooked and recorded as " Negative " or " Normal."

Reading was made after 24 hours at room temperature (14–18° C.). If the tubes are immersed in a water bath at 37° C. a reading can be made after 2 hours, or by using an ice-cooled sol readings can be made after 2 hours at room temperature. Under these circumstances the sol is rendered more sensitive, and the readings obtained cannot be compared without modification with those published here.

The results of the Lange are expressed as follows :

0. Red (practically the same as the control tube).
1. Red-Mauve.
2. Mauve.
3. Mauve-Blue.
4. Blue.
5. Sedimentation (colourless).

Colour changes existing between those mentioned are expressed as $x + \frac{1}{2}$, i.e., " nearly mauve " = $1\frac{1}{2}$, " nearly blue " = $3\frac{1}{2}$.

In practice, such reading renders a still finer degree of evaluation. Lange, in a recent paper (1939), has given instructions for a still more " quantitative " evaluation of the test.

(f) *Modified Takata Reaction* (*M.T.R.*).

A detailed description of this test has been given in previous papers (Fleischhacker, 1938, 1943, and Lane, 1945). It has been pointed out previously that the reaction time of the test is influenced by the temperature of the environment. This is due partly to the increasing alkalinity of the reagent-fluid mixture by the liberation of carbon dioxide from the fluid. This is known to influence the Weichbrodt reaction (Fleischhacker, 1931), and Lane (1945) has shown that this holds good for the M.T.R. The liberation of carbon dioxide may, however, not be the only factor responsible for the decrease in reaction time, for the overlaying of the mixture with liquid paraffin will not prevent a speeding up of the reaction at temperatures above 25° C. As we allow the reaction to continue for 90 minutes, the practice of overlaying the mixture with liquid paraffin is recommended, as this prevents false reactions given late and which can be influenced by the change in pH. The overlaying by liquid paraffin makes the use of a water bath unnecessary at room temperatures up to about 20° C.

The occurrence and increase of very faint turbidities can be easily marked and followed up with a little practice. That naked-eye observation is sufficient could

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be shown by the results obtained by using the Hilger photo-electrometer as a nephelometer.

In the routine examinations we find it most convenient to hold the tube against a dark background and the following definitions are given :

1. ± (Doubtful.)
2. V.F.T. (Very faint trace.) Turbidity just visible.
3. F.T. (Faint trace.) Turbidity plainly visible against a dark background.
4. T. (Trace.) Turbidity visible without dark background.
5. W+ (Weak positive.)
6. + (Positive.)
7. ++ (Strong positive.) (Frequently with sedimentation.)

In addition to the above definitions we are accustomed to make use of a finer definition, and for this reason the signs (*a*) > and (*b*) < are used to signify (*a*) " more than " and (*b*) " less than."

It has to be emphasized that the conditions laid down for the performance of the M.T.R. must be strictly observed, otherwise false results will be obtained. If the test is carried out under liquid paraffin in chemically clean test tubes and using fresh C.S.F. in a moderate room temperature, the results will be found to be consistent and reliable. It is sometimes difficult to evaluate correctly a reading above a " trace," and a reading above a " trace " may be called " weak positive " when in actual fact it is not quite as strong as " weak positive." False results have been given by fluids containing apparently high concentrations of barbiturates, and the presence of traces of antiseptic in which the lumbar puncture needles are kept is likely to give false turbidities, but the turbidity resulting from the presence of contaminants is more " earthy " than the true M.T.R. turbidity, and usually commences to sediment within 20 minutes, although the opacity is weak.

Readings of the M.T.R. are made at intervals of 0, 1, 3, 5, 8, 10, 15, 20, 30, 60 and 90 minutes, and the result is plotted in graph form in a similar fashion to the reading of a Lange.

Comparison between M.T.R. and Lange.

In order to make the two tests comparable, the following scheme has been adopted :

Lange.		M.T.R.	
Tube.	Dilution.	Minutes.	
1	1 : 10	0	1
2	1 : 20	3	2
3	1 : 40	5	3
4	1 : 80	8	4
5	1 : 160	10	5
6	1 : 320	15	6
7	1 : 640	20	7
8	1 : 1280	30	8
9	1 : 2560	60	9
10	1 : 5120	90	10

Intensity of Reaction.

Lange.		M.T.R.
Red	0	Clear.
Red-mauve	1	Faint trace (F.T.).
Mauve	2	Trace (T.).
Mauve-blue	3	Positive (+).
Blue	4	Strong positive (++).
Sedimentation	5	Strong positive with sedimentation.

This scheme is slightly different to the one adopted by Lane (1945), at a time when we were not so experienced. The scheme adopted here does more justice to the lesser intensities of the reactions, while a somewhat greater discrepancy exists with the stronger intensities. The Strong Positive (++) or " 4 " of the M.T.R. is obviously stronger than the Blue (4) of the Lange Reaction. In a number of

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cases a Lange reading of " 5 " will be given where the M.T.R. will not sediment within 90 minutes. Lane's scheme takes more account of these stronger reactions. The readings are entirely empirical, and it should be noted that the two reactions cannot be compared from a mathematical point of view.

Classification of the Curves Compared.

The usual Lange classification of " Paretic," " Tabetic," and " Meningitic " curves is misleading and only of a pseudo-diagnostic value. A " Meningitic " curve can be obtained in the absence of a meningitis, and indeed in the absence of any inflammatory condition. Similarly the two " syphilitic " types are encountered quite often without syphilis being present. To overcome this difficulty, some laboratories speak of " Left," " Middle," or " Right " depressed curves where Left = Paretic, Middle = Tabetic, and Right = Meningitic type. Lange (1930) differentiates 6 types according to the optimal (or maximal) depression of the reaction. These last-named classifications are not suitable for our present purpose, as the forms of the two reactions (Lange and M.T.R.) are different. The difficulty may be overcome to some extent by referring to those causes which for the time being are thought to have most influence on the curves—namely the Albumin-Globulin ratio of the C.S.F. We are well aware that other factors such as pH, quantitative and qualitative fractions of the proteins (euglobulins and others) may influence the development of the reaction, and that these factors may influence both reactions to a different degree. For all practical purposes, however, these exceptions may be overlooked for the time being, and the most probable factor, i.e., the Albumin-Globulin ratio, will be used as the basis for a classification.

The classification used here is therefore :

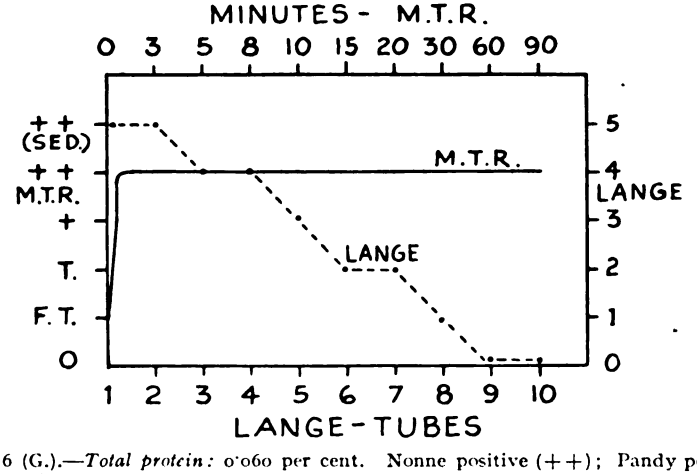
1. The " G " (globulin) type . . Paretic.
2. The "A" (albumin) type . . Meningitic.
3. The " GA" type . . . . Tabetic.

It will be appreciated that in a mixed neuropsychiatric material the typical types (G and A) will be rare, and the majority of curves will belong to a not always very well defined "GA" group.

Results.

1. " *G* " (*globulin*) *Type Curves.*

This type gives a Lange reading of approximately 5.5.5.5.4.3.2.1.1.0 and needs no explanation. The M.T.R. in such cases is characterized by an instantaneous Strong Positive which may or may not sediment. There were 8 cases of G.P.I. The results are recorded graphically as follows :



Case 226 (G.).—*Total protein:* 0·060 per cent. Nonne positive (++); Pandy positive (+). *Cells:* 85 lymphocytes, 13 polymorphs, 1 endothelioid, 12 red cells in 3 c.mm. *Wassermann:* Positive (+++). *Meinicke:* Positive. *Diagnosis:* G.P.I.

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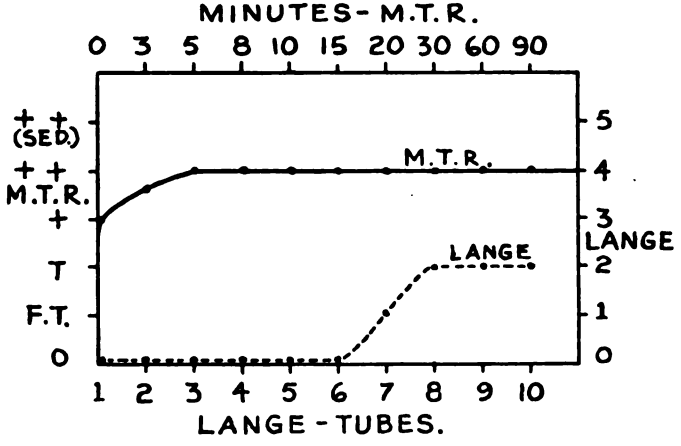
There was agreement between both curves in 7 of these cases. Two of them had a slight "A" admixture which could be well recognized in both tests. The eighth case was one of Juvenile (Congenital) G.P.I., and there was slight disagreement between the curves in that the M.T.R. gave a typical " G " curve while the Lange showed a slightly modified " G " curve with an "A" admixture. Clinically there was, as is so often in these cases, a mixture of paralytic and meningovascular symptoms, so that the Lange may have given a better expression of the pathological processes.

2. The "A" (Albumin) Type.

The "A" type curve is subdivided into two groups.

Sub-Group "A_1."

This was met in a few cases of severe meningitis (after mastoiditis, cerebral abscess, etc.), but also in non-meningitic disorders. There were 7 cases.



CASE 230 (A_1).—*Total protein:* 0·180 per cent. Nonne, positive (++); Pandy, positive (++). *Cells:* Pus cells +++. *Diagnosis:* Meningitis following mastoiditis. Bacteriologically there was a mixed infection.

The typical Lange curve is 0.0.0.1.2.3.4.4.5.5,' while the M.T.R. corresponding to the Lange in these fluids is characterized by an instantaneous Weak positive turbidity which reaches a Strong positive in about 5 minutes. There was good agreement between the 2 curves in 5 of the 7 cases, while in 2 (not of inflammatory origin) the Lange reactions might have fitted better into the second subgroup of the "A" type.

Sub-Group "A_2."

Here the typical Lange curve is 1.1.2.2.3.3.4.4.3.3. The group consisted of 15 cases of quite different aetiology. While the M.T.R. is characterized by an instantaneous turbidity, less intense than in the "A_1" sub-group, it increases slowly throughout the greater part of the reaction time. The two reactions agreed in the following 13 cases:

2 cases of meningococcal meningitis.
3 cases of prolapsed intervertebral disc.
6 cases of neuro-syphilis.
1 case of polyneuritis.
1 case of " cerebellar disorder " (total protein 0·120 per cent., Nonne +, Pandy ++, cell count only slightly increased).

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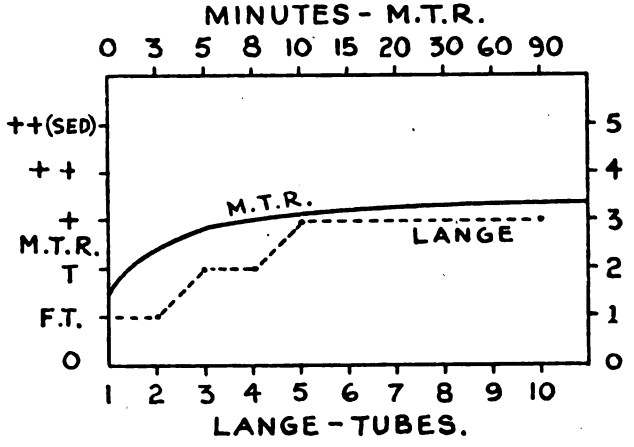
In two cases (post-vaccinial encephalitis and untreated trypanosomiasis) there was disagreement between the two reactions. The M.T.R. was more of the "A_2" type, while the Lange showed a modified " G " type curve. Incidentally, among the group of 30 cases described so far, these two cases were the only ones showing a noteworthy qualitative disagreement between Lange and M.T.R.



CASE 329 (Type A_2).—*Total protein:* 0·150 per cent. Nonne, +; Pandy, ++. *Cells:* 7,000 in 3 c.mm. *Diagnosis:* Meningococcus meningitis.

There were two small groups comprising 10 cases in all, in which in one group the Lange did not develop, and in the second where the M.T.R. did not develop correspondingly to the other routine reactions. It is interesting to note that in 3 of these last cases (? polyradiculitis or arachnoiditis, trypanosomiasis* and ? amyotrophic lateral sclerosis), Pandy's reaction was definitely stronger than the Nonne. A fourth case was a patient with a rapid generalized softening of the brain.

3. *The " GA" Type Curves.* (Tabetic.)

This type forms the main group of our material.† There are again two sub-groups, the larger group having a Lange which gives most change in the higher concentrations, and where the M.T.R. reaches its maximum within 10 or 15 minutes (sub-type Ga). In the second and smaller sub-group the Lange is more drawn out, and the maximum depression is seen in the lesser concentrations while the M.T.R. develops later (sub-type gA). Graphically, the peak of the curves lay between " 2 " and " 3," and consequent to the moderate strength of this reaction type, small errors in reading may produce relatively marked alterations in the forms of the curves. Therefore in a number of these cases, due to the factor mentioned above and also due in part to the relatively slight changes in the C.S.Fs. if compared with types " G " and "A," the picture is not always very outspoken.

Sub-Group " Ga."

The material in the group comprised 57 cases of mixed neurological (central and peripheral) cases and also a number of schizophrenics. There was good agreement in 51 cases (see Case 296), and still reasonably good agreement in the remaining 6 cases between the two reactions.

* This case has been published by Lt.-Col. Bomford, R.A.M.C. (1944).

† The material published in Parts 2 and 3 of this paper also belongs more or less to it.

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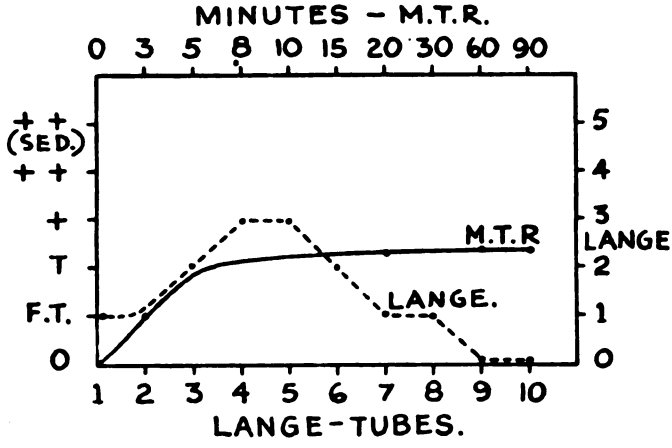
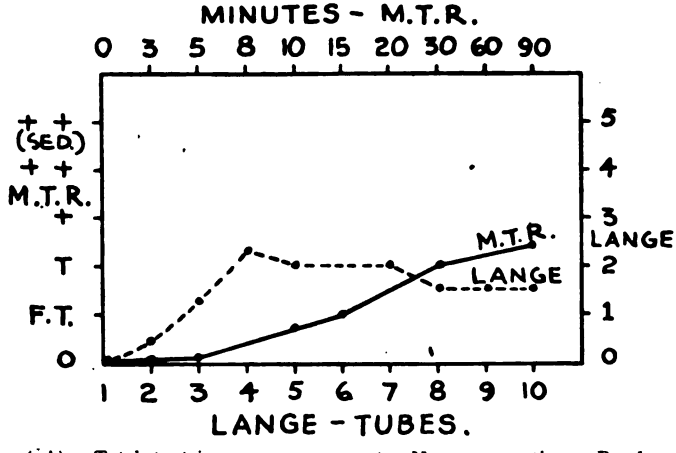


CASE 296 (Ga).—*Total protein:* 0·020 per cent. Nonne, faint trace; Pandy, doubtful. *Cells:* 1 lymphocyte, 13 red cells in 3 c.mm.

Sub-Group "gA."

There were only 9 cases. There was good agreement between the two reactions in 6 cases and not quite so good an agreement in 2 cases. In the ninth case there was a definite qualitative disagreement between the two tests. The Lange was almost negative while the M.T.R. was definitely of the "gA" type (total protein 0·020 per cent.; Nonne doubtful; Pandy trace; cells, 1 lymphocyte in 3 c.mm. Diagnosis: Prolapsed intervertebral disc).



CASE 250 (gA).—*Total protein:* 0·020 per cent. Nonne, negative; Pandy, negative. *Cells:* 2 lymphocytes in 3 c.mm. *Diagnosis:* Schizophrenia.

There is a last group of 16 cases where the reactions were either negative or doubtful.

The ideal negative reaction is that where the curves do not show any appreciable change. But in some cases there were slight changes in the Lange of not more than "1" intensity in 4 (or 5) tubes, and a very faint trace in the M.T.R. not appearing before 10 or 15 minutes and not increasing in strength. These very slight changes might also be called negative. Both reactions agreed in 10 negative C.S.Fs. In 5 cases both reactions were so very little outspoken in type (qualitatively) and intensity (quantitatively) that they should be classed as doubtful. So there were 15 cases in which agreement was found.

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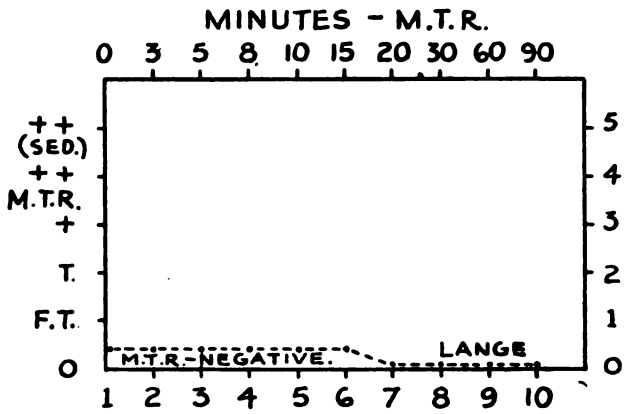
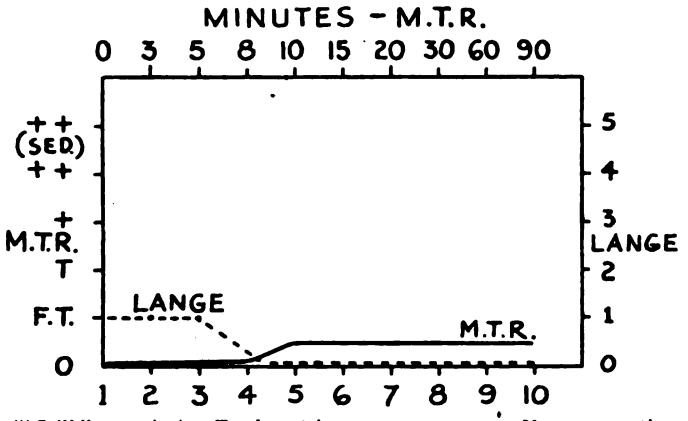
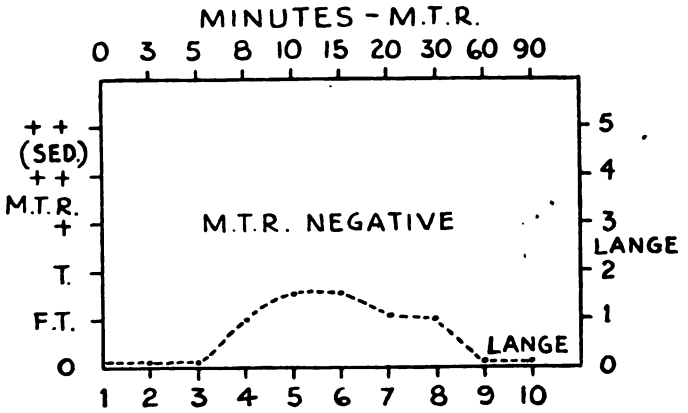


Case 283 (Negative).—*Total protein:* 0·010 per cent. Nonne, negative; Pandy, negative. *Cells:* 4 lymphocytes in 3 c.mm. *Diagnosis:* Mental deficiency.



Case 273 ("Still" negative).—*Total protein:* 0·015 per cent. Nonne, negative; Pandy, negative. *Cells:* 3 lymphocytes in 3 c.mm. History of syphilis two years previously.

In the last case of this group (Schilder's disease ?, tuberous sclerosis ??) there was a doubtful Lange test (0.0.0.1.1½.1½.1.1.0.0.) while all the other tests were definitely negative.



Case 291 (Doubtful).—*Total protein:* 0·015 per cent. Nonne, negative; Pandy, negative. *Cells:* 2 lymphocytes in 3 c.mm.

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Conclusion.

The plotting of the Lange and M.T.R. " Time-Curve " reactions are based on quite different principles. The Lange is a geometrical dilution, while the M.T.R. is a curve based on time and has no mathematical proportions. In spite of this both curves gave good corresponding results in about 80 per cent. of the cases and still reasonably good agreement in a further 10 per cent., leaving 10 per cent. in which an active disagreement is noted.

The analysis of over 120 cerebrospinal fluids, most of them of " organic " origin, shows that the M.T.R., similarly to the Lange, can exhibit three main types of curve when plotted as a " time-curve " reaction:

1. *Type " G."*—Corresponding to the so-called " Paretic " curve of the Lange reaction. It is characterized by a marked turbidity appearing at once, with or without sedimentation appearing within the 90 minutes of the reaction time.

2. *Type "A."*—This curve corresponds to the " Meningitic " Lange curve. Here the turbidity appears at once to a strength of " trace " or stronger, and increasing to its maximum either within a few minutes (sub-type A_1), or developing slowly throughout the greater part of the reaction time (subtype A_2).

3. *Type " GA."*—The curve corresponds to the " Tabetic " Lange curve. The characteristic feature is either a turbidity developing during the first 1–3 minutes and reaching its maximum within 10–15 minutes (sub-type Ga), or appearing later and increasing slowly in intensity (sub-type gA).

Although the intensities of the reactions of the " GA " type are usually much less marked than in types G and A, and consequently small errors in reading will have a comparatively strong effect on the form of the curves, it is noteworthy that the qualitative and quantitative agreement was on the whole satisfactory. The same holds good for the " doubtful " and " negative " curves.

The findings described here are in good principal agreement with those from the examination of well over 100 cerebrospinal fluids examined later and reported in the second and third parts of this paper.

PART II.—THE SIGNIFICANCE OF SMALL CHANGES IN THE REACTIONS.

In spite of the close agreement between the two reactions, it is not suggested that the M.T.R. should replace the Gold Sol Test. The M.T.R. has the advantage of being simple and being quickly performed. It uses only one tube, and its results (turbidities) are easier to read in doubtful cases than the slight colour changes of the Lange. It also has the advantage of giving a characteristic change within 30 minutes or less (although it should be followed up for 90 minutes) as against the 24 hours reaction time needed for the Lange.* The Lange has the advantage of giving somewhat more " characteristic " curves, of using a much lesser quantity of cerebrospinal fluid, and the number of tubes will show up possible technical errors more easily than the one tube used for the M.T.R.

If one is content to obtain " characteristic " curves in " characteristic " diseases the Lange test may be preferred, although in most of such cases the " diagnosis " from the cerebrospinal fluid can be made without using a colloidal test at all. But if one thinks differently and wishes to use the colloidal reactions in difficult clinical cases, especially in order to describe the presence or absence of " organic " components, then both reactions should be used in a more " quantitative " way. The difficulty in the evaluation of such borderline cases is generally that very often some of the tests (total protein, cells and Pandy) seem to be negative against a " doubtful " Nonne and a similar Lange or M.T.R., and then the cerebrospinal fluid is usually given as " still normal." The careful use and reading of the two colloidal reactions, satisfactorily agreeing and therefore supporting each other, will make it easier to make a decision, and it will be seen that in such circumstances quite a number of cerebrospinal fluids will turn out to be slightly pathological.

* If the water bath (37° C.) technique or an ice-cooled gold sol are used for the Lange, the reaction time is considerably reduced. One has to bear in mind, however, that by the speeding up of the test the sensitivity of the sol is considerably increased, and the changes even in " normal " curves are greater than those described in this paper.

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It is not very easy to define a normal cerebrospinal fluid. One might prefer to answer the question indirectly by saying that a normal cerebrospinal fluid is a fluid which we do not receive for examination as a rule. A lumbar puncture is not done unless a patient is considered to be suffering from an organic disease of the central nervous system (or otherwise). The great majority of fluids described in the first part of this paper have been drawn from patients suffering from an active organic neurological disorder* (in order to establish that the results obtained were of pathological significance), and also the fluids received from psychotic patients are usually from those of the " organic " type. But among more than 450 cerebrospinal fluids examined in this laboratory during the last two years, there were well over 20 which might be considered as not being pathological. They came from neurotic and manic-depressive patients, from a few cases of suspected, but not confirmed neurological disorders, and from patients clinically and serologically cured of syphilis.

On the experience of this small material, if compared with the volume of pathological fluids, we have come to the following conclusion with regard to the evaluation of the individual routine tests applied to cerebrospinal fluids. It will be seen that they are in agreement with the views expressed by Lange and Neel and their schools, although our results are obtained with less elaborate methods than those used by these authors, and also by Kafka and Samson (1928) and their followers. We think that a cerebrospinal fluid should not be considered as normal unless Pandy and Nonne are negative, total protein under 25 mgm. per 100 c.c., cells less than 5 in 3 c.mm., and Lange and M.T.R. negative, or if only *one* of these reactions shows a *very* slight deviation from these standards.

Evaluation of Results.

Pandy and Nonne Tests.

The tables show that there are a number of C.S.F. in which the Pandy and Nonne tests are negative, but which have slightly positive M.T.Rs. and Langes. This is a consequence of too early a reading being made of the tests. The agreement is much better if longer reaction times are used. It is suggested that neither of these two reactions should be read before 15 minutes have elapsed. We have, however, published the results obtained after 10 seconds for the Pandy and 3 minutes for the Nonne in order to show that even then a careful reading of the M.T.R. and Lange together will reveal possible abnormalities of the fluids.

Total Protein.

As the normal protein content of the cerebrospinal fluid is most likely not much higher than 20 mgm. per 100 c.c., readings of 25 mgm. per 100 c.c. should be regarded as possibly abnormal, indicative of a qualitative or quantitative change in the protein composition of the fluid.

Looking through the whole of our material with total protein readings of 25 and 30 mgm. per 100 c.c. there is only one case (338) where, apart from pathological Lange and/or M.T.R., no other change could be detected. For more material see Neel (1939) and Lane.

We think that in spite of the errors attached to the technique, values of 25 mgm. per 100 c.c., or higher, obtained by the turbidometric estimation of protein, will be of use in deciding that a " doubtful " fluid is really pathological.

Cell Count.

According to Neel (1939) a normal cerebrospinal fluid should not contain more than one cell in 3 c.mm. This is apparently confirmed in the greater number of our normal cases. Still, one might feel that this is a little rigid, and prefer Lange's (1939) formula that a normal cerebrospinal fluid does not contain more than one cell per c.mm. and probably less. Cell counts of 4/3 or 5/3 should be considered as " borderline," and anything higher as definitely abnormal.

* Most of these fluids were kindly given to us by Major T. Crawford, R.A.M.C., and I wish to express my thanks to him.

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Modified Takata Reaction.

This reaction is definitely negative when the reagent-fluid mixture remains clear. A " very faint trace " of turbidity occurring after 10 or 15 minutes and not increasing during the reaction time will also for the time being be considered as negative. " Trace " reactions are always pathological if the technique is properly carried out.

Lange Reaction.

This reaction is usually considered to be still normal if the colour change is not more than " 1," and even a " 2 " reaction in one or two tubes is often evaluated as non-pathological. The technique of performing and reading the test as described above and applied to active organic conditions demonstrates the close comparison with the other reactions, especially the M.T.R. It has taught us that a reaction of " 1 " in more than 5 tubes (perhaps even in more than 4 tubes) cannot be considered as normal.* Reactions with a change of " 1½ " in more than 2 tubes should be regarded as doubtful, and a " 2 " change even in 1 tube is of slight but definite pathological significance.

After having discussed the criteria of the individual tests, we publish now the findings on 56 fluids obtained from patients suffering from organic central nervous system disease (Tables I, II and III). The results are not those published previously by myself or Lane, and therefore support our former findings and deductions. They also support the views held by authors such as Lange and Neel.

Definitely negative cerebrospinal fluids, i.e., with cells below 5/3, Pandy, Nonne and M.T.R. all negative, Lange showing no change and total protein lower than 25 mgm. per 100 c.c. have been omitted, and also findings which would be generally considered to give the results of the examination as slightly pathological or abnormal.

The idea is, as mentioned above, to demonstrate how a careful evaluation and comparison of the routine tests will enable us in many cases, although not in all, to make a decision, although some of the results obtained are seemingly conflicting. It should not be forgotten that although cell count and protein reactions often run parallel, this need not always be the case. One sometimes finds as an expression of the slightest " mechanical irritation " of the meninges a slight rise in the cell count without a distinctive disturbance of the proteins, or, more often, and as most marked in the Froin syndrome, a strong increase of the proteins without an increase in the cell count.

The tables have been arranged in three parts according to the cell count. The first group gives the results of cases with a cell count of 11–15/3. This group is the smallest as, naturally, the proteins very often show a distinctive disturbance in several of the tests and such fluids have been omitted. The second group is composed of the findings with fluids having a cell count of 5–10/3, with finally the group with cell counts up to 5/3, the largest groups of this material.

In the following tables the Lange is given in figures, the M.T.R. is given at its 30 minute value, and in this, as with Nonne and Pandy, the strength of the turbidity is expressed as ± = doubtful, V.F.T. = very faint trace, F.T. = faint trace, T. = trace, W+ = weak positive, + = positive, ++ = strong positive. The prefix " L " found in some of the M.T.R. results stands for " Late " in such cases where the turbidity did not develop within the first ten minutes.

Other abbreviations used are: *Pro.*, Total protein in mgm. per 100 c.c. *N.*, Nonne. *P.*, Pandy. *M.T.R.*, Modified Takata Reaction. <, Less than . . . >, More than . . .

TABLE I.—*Fluids with a Cell Count of* 11–15 *Cells in* 3 *c.mm.*

No.	Cells.	Pro.	N.	P.	M.T.R.	Lange.	Diagnosis.
310	11/3	25	±	—	>Tr.	1.1.1.2.2.2.1.0.0.0	Spinal process C5.
332	11/3	30	±	±	>Tr.	1.1.1½.2.1½.1.1.½.½.0.	Organic cerebellar disorder.
270	12/3	30	Tr.	Tr.	W+	1.1.2.2.2.3.2.1.0.0.	Trypanosomiasis.
448	13/3	20	—	—	<Tr.	1.1.1.1½.1.1.1.1.0.0.	? Neurosyphilis.
439	14/3	20	L.F.T.	V.F.T.	>Tr.	½.½.1.1½.1½.1.½.½.0.0.	Epilepsy.
381	14/3	30	F.T.	F.T.	>Tr.	0.1.1.2.2.2.1.1.0.0.	Cysticercus.

* We wish to point out again that this does not hold good for the results obtained with the speeding-up techniques which render the sol more sensitive.

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TABLE II.—*Fluids with a Cell Count of 5–10 Cells in 3 c.mm.*

No.	Cells.	Pro.	N.	P.	M.T.R.	Lange.	Diagnosis.
338	5/3	25	—	—	L.V.F.T.	½.½.½.½.0.0.0.0.0.0.	Jacksonian epilepsy.
264	5/3	20	±	F.T.	F.T.	½.½.½.0.0.0.0.0.0.0.	Traumatic instability
428	5/3	23	±	—	±	½.½.1½.1½.1½.½.0.0.0.0.	Involutional melancholia
358	5/3	20	±	—	Tr.	0.0.1.1.1.1.0.0.0.0.	Gumma of nose.
277	5/3	20	F.T.	—	Tr.	½.1.1.2.1.½.0.0.0.0.	Fainting spells; ? neurosyphilis
451	6/3	20	—	—	—	½.1.1.1.1.1.0.0.0.0.	Spinal process ?
275	6/3	20	—	±	—	½.½.½.½.½.0.0.0.0.0.	Epilepsy.
317	6/3	20	—	±	L.T.	1.1.1.1.1½.0.0.0.0.0.	,,
379	6/3	20	—	±	Tr.	0.0.1.1.1.2.2.1.1.0.	Fainting attacks.
370	6/3	20	F.T.	±	Tr.	0.0.1.2.2.2.2.2.1.0.	Cysticercosis.
269	6/3	20	F.T.	F.T.	Tr.	1.1.1.2.2.2.1.1.0.0.	Wasting of left leg.
370	7/3	20	—	—	Tr.	0.0.½.1.1.1.1.1.0.0.	Epilepsy.
468	7/3	20	—	±	<L.Tr.	Not done	Jacksonian epilepsy.
410	7/3	20	±	—	<Tr.	0.0.0.1.1.1.1.0.0.0.	Old meningitis, now epileptic fits.
422	7/3	30	Tr.	±	VW+	1½.1½.1.½.0.0.0.0.0.0.	Encephalitis.
319	8/3	<20.	±	±	<Tr.	0.0.0.1.1.0.0.0.0.0.	Treated neurosyphilis.
299	8/3	30	±	±	>Tr.	0.0.0.0.1.1.1.1.1.1.	Organic psychosis.
387	8/3	25	±	±	>Tr.	0.0.½.½.1.1.1.½.½.½.	Organic neurological disorder.
426	8/3	25	F.T.	±	VW+	1.1½.2.2½.1½.1½.0.0.0.0..	Psychosis after head injury.
287	8/3	30	F.T.	F.T.	>Tr.	0.1.1.1.1.1.0.0.0.0.	Attacks of unconsciousness.
292	8/3	25	F.T.	F.T.	Tr.	1.1.2.2.1.1.1.0.0.0.	Sciatic neuritis.
325	9/3	25	—	—	±	½.½.1.1½.1½.1.½.½.½.0.	Unequal pupils.
388	9/3	25	±	—	Tr.	0.½.½.1.1.1.½.½.0.0.	? Cerebral tumour.
395	9/3	30	F.T.	F.T.	+	½.1.1½.2.2½.2½.2.1½.½.½.	Incipient G.P.I.
307	9/3	25	±	—	Tr.	0.0.1.1.1.1.1.0.0.0.	Optic atrophy.

TABLE III.—*Fluids with a Cell Count of 0–4 Cells in 3 c.mm.*

No.	Cells.	Pro.	N.	P.	M.T.R.	Lange.	Diagnosis.
334	0/3	20	±	—	Tr.	½.½.1.1.½.½.½.0.0.	Neurosyphilis.
328	0/3	20	±	—	>Tr.	1.1.½.½.½.½.0.0.0.	Amyotrophic lateral sclerosis.
311	0/3	30	—	±	±	0.0.1.2.2.2.1.0.0.0.	Cerebral tumour.
339	0/3	25	F.T.	—	Tr.	½.½.½.1½.½.½.0.0.0.0.	Organic dementia.
376	0/3	30	F.T.	±	W+	1.1.1.2.1.1.0.0.0.0.	Sciatic neuritis.
300	0/3	30	V.F.T.	F.T.	Tr.	½.1.1.1½.2.1½.1½.1.½.½.	Incipient neurosyphilis.
452	1/3	20	—	—	Tr.	½.½.1½.1½.1.1.½.½.0.0.	Gumma of skull.
337	1/3	20	±	±	Tr.	1.1.1.1.½.0.0.0.0.0.	Epilepsy.
295	1/3	25	±	±	V.F.T.	1.2.2.2½.2½.2.1.0.0.0.	? Neurosyphilis.
296	1/3	20	F.T.	±	W+	1.1.2.3.3.2.1.1.0.0.	Neurosyphilis.
439	1/3	25	F.T.	F.T.	Tr.	½.1.1.1½.2.1½.1½.1.½.½.	Incipient neurosyphilis.
265	1/3	20	±	Tr.	Tr.	½.½.½.½.0.0.0.0.0.0.	Prolapsed intervertebral disc.
291	2/3	15	—	—	—	0.0.0.1.1½.1½.1.0.0.0.	? Schilder's disease.
412	2/3	20	—	—	<Tr.	0.0.0.1.1.1.1.0.0.0.	Spinal lesion.
274	2/3	20	±	±	Tr.	1.1.1.1.2.2.1.1.1.1.	Neurosyphilis.
304	2/3	25	±	V.F.T.	Tr.	1.1.1.1.1.1.0.0.0.0.	Epilepsy with reflex disturbances.
323	2/3	30	±	±	Tr.	0.0.1.1.2.2.1½.½.0.0.	Spinal process.
385	2/3	25	±	F.T.	W+	½.1.1½.2½.2½.1.½.½.0.0.	,, ,,
336	2/3	25	F.T.	F.T.	W+	1.1.1½.1½.1.1.1.0.0.0.	Rapid softening of brain.
425	2/3	30	±	V.F.T.	>Tr.	1½.2.2½.2.2.1.½.0.0.0.	Neurosyphilis.
288	3/3	20	—	—	L.F.T. ?	1.1½.2.2.1½.1½.1½.1.1.0..	Sciatica.
271	3/3	20	±	—	Tr.	1.1.2.1.1.1.1.0.0.0.	Wasting of quadriceps.
457	3/3	30	V.F.T.	Tr.	>Tr.	1.1.1.1½.1½.1½.1.1.0.0.	*Petit mal.*
331	4/3	20	—	—	Tr.	½.1.1.2.2.2.2.1.1.0.	Amyotrophic lateral sclerosis.
389	4/3	25	F.T.	±	>Tr.	0.½.½.1.1½.1½.1½.½.0.0.	Organic cerebral disorder.

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Although the results of the Lange reaction as expressed in figures and that of the M.T.R. as its 30 minutes value allow only of a fair comparison between the two tests, it will be noticed that the agreement is satisfactory in the majority of the 56 cases of this selected borderline material.

The tables show that we have not been able to solve all the difficulties and contradictions, especially as far as slight qualitative and quantitative changes in the protein composition of the C.S.F. are concerned, but we hope we have been able to demonstrate the value of the routine tests applied to the cerebrospinal fluid in " borderline " cases, and think that the collaboration between clinician and pathological laboratory might benefit from it. Such benefits might possibly be most valuable in clinically doubtful cases, and also in those cases where the clinical examination shows undoubted signs of organic disease, and the laboratory returns the results of the examination of the cerebrospinal fluid as " within the normal," while in reality it is slightly pathological.

Summary and Conclusion of Parts 1 and 2.

1. 122 cerebrospinal fluids, the overwhelming majority of them taken from mixed organic neuro-psychiatric material, have been investigated for cells, total protein, Nonne and Pandy, Lange and M.T.R. (W.R. and Meinicke have also been carried out).

2. The M.T.R. has been plotted as a " Time-Curve " and compared with the Lange.

3. The two tests were in agreement in 80–90 per cent. of the cases, varying in strength from negative to strong positive, with sedimentation in both reactions.

4. In 56 " organic " cases comparison of the two reactions with the other routine tests shows that quite a number of cerebrospinal fluids usually considered as " normal " are in fact pathological. The " normal " limits of the tests applied have been defined and discussed.

5. A careful comparative examination and evaluation of the different compounds of the C.S.F. should be of some help to the neurologist or psychiatrist in deciding the presence or absence of functional or organic conditions.

PART III.—THE LANGE AND MODIFIED TAKATA REACTION IN THE CEREBROSPINAL FLUIDS OF TYPICAL SCHIZOPHRENICS.

In the third and last part of this paper the experiences gained from the first two parts will be applied to the cerebrospinal fluids of about 40 typical schizophrenics.

When one gains more experience in psychiatry, one finds an increasing number of atypical cases among the so-called non-organic psychoses, and one gets more and more reluctant to make a diagnosis of schizophrenia unless the cases are very typical, or one has the opportunity of watching them for a long period. We have seen to an ever-increasing degree that schizophrenic syndromes are often superimposed on organic disturbances such as G.P.I., epilepsy, arteriosclerosis, high-grade mental deficiency, tumours of the brain and so on. Even if one can exclude organic conditions, there remains apparently a number of mixed psychoses which make classification difficult. It is true that heredity, and still more constitution, may act as a guide; but constitution is one factor only. Is it the decisive one? Let us take the example of tuberculosis, which not so long ago was considered hereditary or constitutional. There is no doubt about the importance of the asthenic type for this disease, but the person with a pyknic or athletic build may give way to tuberculosis, while an under-nourished asthenic may suffer from a simple bronchitis of non-tuberculous origin. I do not think it is proved beyond doubt that a cycloid personality may not acquire a schizophrenia and vice versa. Or take another example which will show the difficulty of clinical diagnosis; I refer to the change of symptoms which we have noticed during the last 10 or 20 years in G.P.I. The grandiose paralytic has become very rare. So have the classical cases of mania and perhaps of depression, and with regard to hysteria one may say that " la grande hystérie," except perhaps in wartime or similar " emergency " conditions, is usually not a hysteria but a commencing G.P.I. or disseminated sclerosis, a tumour of the frontal brain, or a schizophrenia, etc.

Since the therapeutic situation has improved, the necessity for making a proper diagnosis has become still more urgent and of greater practical importance. The

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question of " in which condition should which treatment be applied," and what the prognosis will be, are in the minds of everyone who has to make a decision.

For the last two years investigations have been going on in this hospital with a view to seeing whether the laboratory can aid in establishing the diagnosis, especially that of schizophrenia.

The prospects and retrospects of such an approach are not very encouraging. About 30 years ago it was hoped that Abderhalden's dialysis method might give some help, but it came to nothing. About 20 years ago we had the era of permeability estimations, but when the method had been standardized, the differences between the individual non-organic psychoses became insignificant. Some years later, Zondek and his collaborators thought they could separate the manic-depressive group from the others by estimating what they thought was the bromide content of the blood. Unfortunately they only estimated hydrogen peroxide. Again, a few years later, Lehman-Facius claimed to have solved the problem by estimating special enzymes of a lipoid-splitting nature, but apparently the shaking of the reagent mixture was of greater importance than the kind of illness!

There has been, however, some quieter work going on in some laboratories on the proteins of the C.S.F. Kafka and his collaborators (1928) and Neel and his school (1933), working with different methods, found that in typical schizophrenics a disturbance of the C.S.F. protein exists, with the high probability of an increase in the so-called globulin fraction. The methods of these workers are somewhat complicated and have not become very popular. It is here that our investigations started. The methods we are using have been known for a very long time, and I want to make it clear from the beginning that our claims hold good only, at least for the time being, for typical active cases of schizophrenia, and also that the results are not of a specific but of a characteristic or typical nature. I have also to point out that the results can be used as a diagnostic help only in close collaboration with the clinician, who has to assure us that the patient is not suffering from an " organic " disorder. This relation between the clinician and the laboratory is, however, the usual one existing in all cases where the laboratory results are of a non-specific nature. An increase in the cell content, an increase in the proteins and a paretic Lange curve may be results given by quite different conditions. The mixing up of " typical " or " characteristic " with " specific " is one of the reasons why one of the reactions mentioned here, namely the Takata reaction, has been in disrepute for many years.

The method applied during the first phase of our investigations, apart from cell count, Nonne and Pandy reactions, was a Modified Takata Reaction. During the second phase, the Modified Takata Reaction has been transformed into a " time-curve " reaction and has been compared with the colloidal gold curve.

There are a few points which have to be emphasized. The Takata Reaction as applied to cerebrospinal fluid has not a very good reputation. This is due mainly to two factors :

1. To the disappointment that the reaction could not be used as a kind of Wassermann reaction as it was formerly claimed and hoped. This view arose from the mixing up of " characteristic " and " specific." A positive reaction is most likely due to an increase in the globulin fraction of the protein. This is one of the main characteristics of the changes found in the cerebrospinal fluid in syphilitic conditions, but it is not " specific " at all, and it will occur in other conditions affecting the central nervous system, and these are many.

2. As the test is very easily performed, many people think that technical conditions can be ignored. The contrary is true, and with an old C.S.F. quite erroneous results may be obtained. This point has also been discussed by Lane.

In the first paper on the M.T.R. it had been stated that the reaction might be performed as a time-curve reaction. With the later work we made a closer observation of the development of the reaction, with time as one of the more important factors. So we started to put down the results of the M.T.R. as a time-curve reaction and to make the comparisons with the Lange curve. We began to overhaul our technique of reading and interpreting the gold-sol test, and made the rather unpleasant discovery that we had always misread and most likely misinterpreted the small changes in the test. If one wishes to read the Lange curve in a proper manner, one has to compare each tube with the control tube and also the test-tubes with each other. If this is done it will be found that what is usually read as

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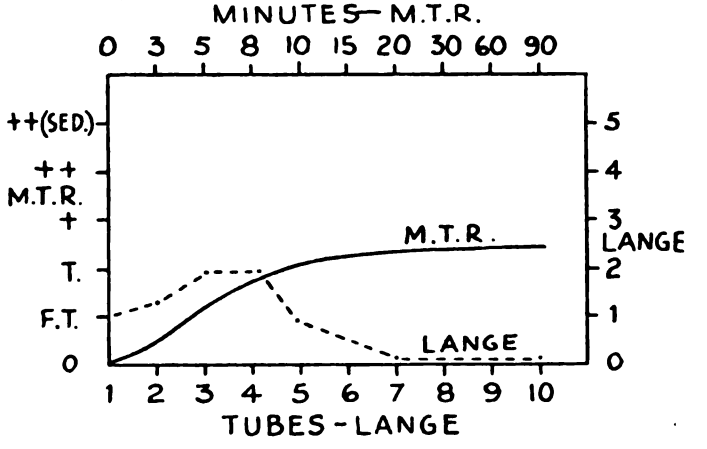
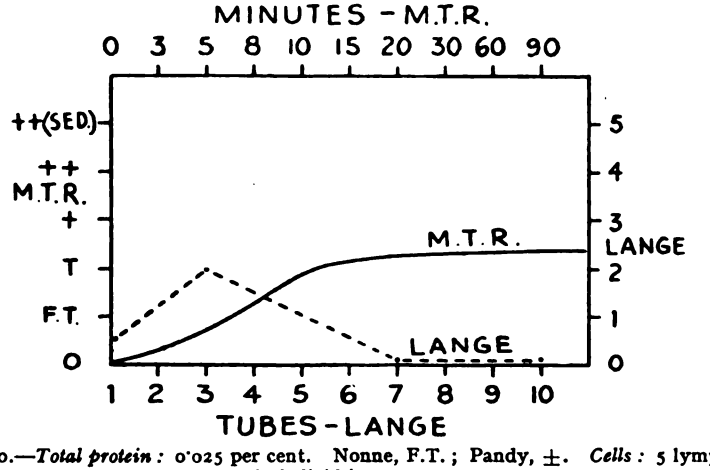
0.1.1.0.0.0.0.0.0.0. will often turn out to be ½.1.1½.1.½.0.0.0.0.0. The second unpleasant discovery was that a reading such as 0.1.2.1.0, which is usually considered as of no significance, is not normal at all, but slightly pathological. This is the outcome of about 250 examinations in which Lange, M.T.R., cell count, total protein and Nonne and Pandy reactions have been compared. Far more than half of the fluids came from patients suffering from organic disorders of the nervous system. I owe nearly all of the organic fluids to the kindness of Major Crawford and Major Hart-Mercer, R.A.M.C., and I wish to express my thanks to them.

I should like to show first some of the curves obtained on the organic and also on the negative non-schizophrenic control material. You will see that the curves of the M.T.R. and Lange show a certain agreement, although the Lange is a dilution curve obtained from 10 tubes, while the M.T.R. is a curve showing the development of a one tube reaction over a period of 90 minutes.* There is a very close agreement between the two curves in at least 80 per cent. of cases, and a reasonably good agreement in another 10 per cent.

I wish to show you now some curves obtained on schizophrenics:



Case 397.—*Total protein:* 0·023 per cent. Nonne, ±; Pandy, ±. *Cells:* 3 lymphocytes in 3 c.mm.



Case 430.—*Total protein:* 0·025 per cent. Nonne, F.T.; Pandy, ±. *Cells:* 5 lymphocytes, 1 endothelioid in 3 c.mm.

* A number of the curves published in the first part of this paper were demonstrated here.

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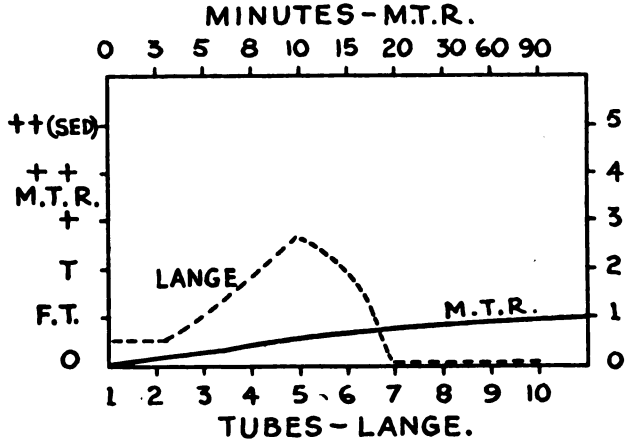
If you compare them with the negative or doubtful curves which you saw before you will agree that they are definitely different. They are of the GA type and of pathological significance. So far I have got curves from the fluids of about 40 typical schizophrenics, but it might be concluded by analogy that similar results would have been obtained in at least 40 to 45 out of the 53 fluids on which I had reported in a previous paper (1943).

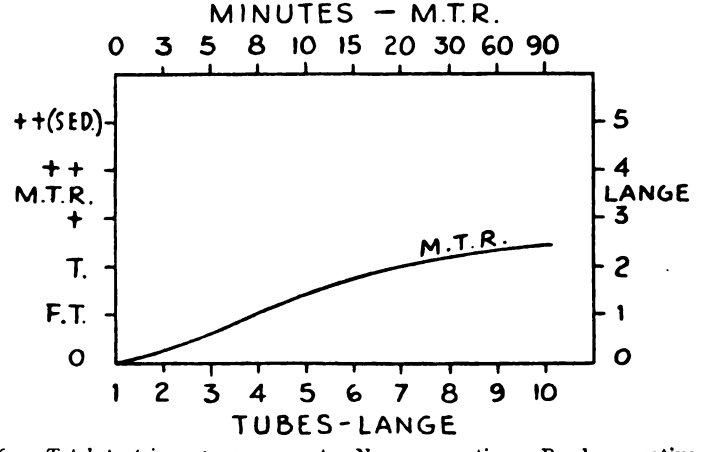
There is a possibility that feverish complications influence the M.T.R. to a higher degree than the Lange as seen in four cases.



CASE 297.—*Total protein:* 0·030 per cent. Nonne, T.; Pandy, ±. *Cells:* 2 lymphocytes, 1 polymorph in 3 c.mm. *Diagnosis:* Schizophrenia with P.U.O.

Although I would not like to commit myself to say more than that the results hold good only for cases of typical schizophrenia, I cannot resist the temptation to demonstrate a few cases where the laboratory has given a lead in establishing the diagnosis.

CASE 1.—This girl was admitted with a differential diagnosis of schizophrenia or a reaction of a schizoid, high-grade mental deficient personality on the birth of an illegitimate child. The patient was very impulsive on reception. She was transferred to the special treatment ward, and improved spontaneously to such an extent that the diagnosis of an active psychotic process was disregarded in spite of the results obtained from the examination of the C.S.F. (unfortunately only the M.T.R. was performed.)



CASE 362.—*Total protein:* 0·025 per cent. Nonne, negative; Pandy, negative. *Cells:* 3 lymphocytes, 3 polymorphs in 3 c.mm.

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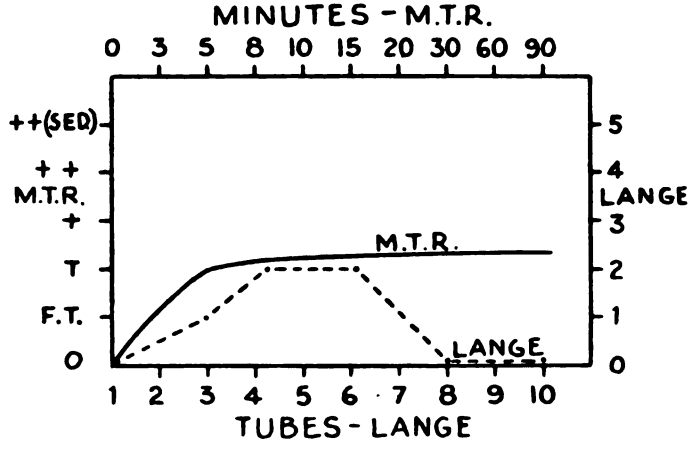
Only after another fortnight's observation on the ward and the occupational therapy department was it discovered that the girl was actively hallucinated, and later on other schizophrenic features became more pronounced.

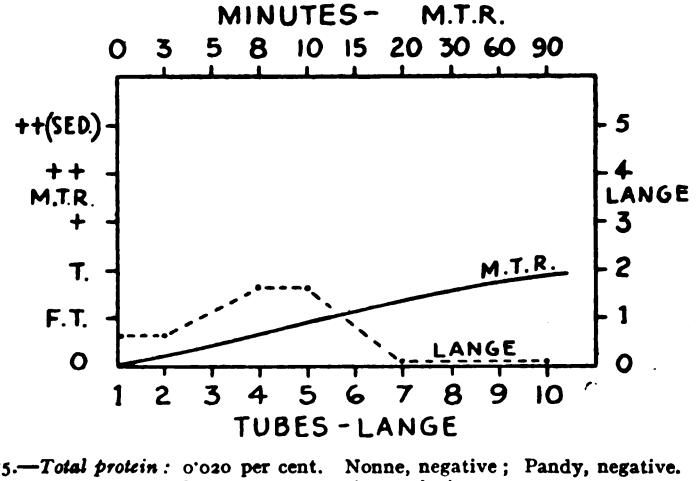
CASE 2.—The next case was similar. The results of the C.S.F. examination were as follows:



CASE 369.—*Total protein:* 0·030 per cent. Nonne, Trace; Pandy, ±. *Cells:* 2 lymphocytes in 3 c.mm.

On the special treatment ward the boy behaved in such a manner for a long time that the laboratory result was doubted. Later on, however, the boy became retiring, shy and actively hallucinated.

CASE 3.—This is a case of a girl who had been here under observation several months ago. We had come to the conclusion that she was suffering from a psychopathic personality, and a schizophrenia was excluded. She was discharged. She relapsed however, and was readmitted. Clinically there seemed to be no change. A lumbar puncture was performed in the hope of obtaining a normal C.S.F. The result in this respect was, however, disappointing, and you can see from the curve obtained that the fluid was slightly pathological.



CASE 375.—*Total protein:* 0·020 per cent. Nonne, negative; Pandy, negative. *Cells:* 5 lymphocytes, 4 polymorphs in 3 c.mm.

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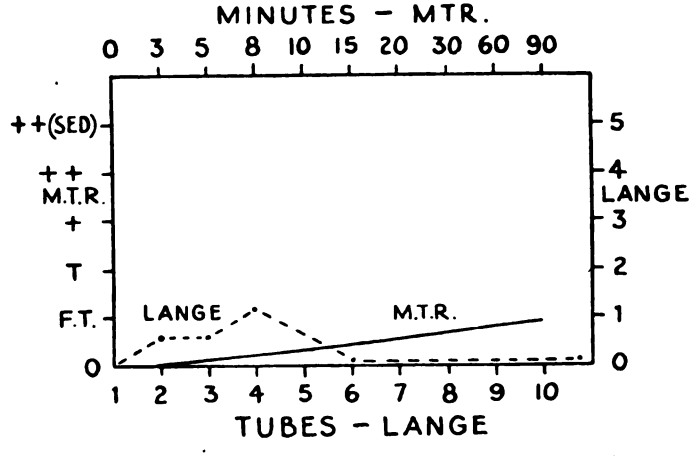
When examined again she admitted now that she had been suffering from ideas of reference and from auditory hallucinations for quite a while, but she had been so frightened by these experiences that she did not dare to talk about them when questioned previously.

CASE 4.—This girl was admitted with the diagnosis of hebephrenia. The results of the examination of the C.S.F. were as follows:



CASE 363.—*Total protein:* Insufficient for estimation. Nonne, negative; Pandy, negative. *Cells:* 3 lymphocytes in 3 c.mm.

A careful study of the history of the patient, and observation on the ward and the occupational therapy department, showed that the hebephrenic reaction on an unhappy love affair was superimposed on a high grade mental deficiency.

The previous findings that the M.T.R. is slightly positive in typical cases of schizophrenia has thus been confirmed on another series of such fluids, and the results are supported by slight pathological changes of the Lange reaction. As far as this test is concerned it had been claimed from time to time that it is slightly positive in the fluids of schizophrenics, since Galant-Ratner, from Bechterew's Institute, made the first contribution in 1924. The accuracy of such claims had been doubted by most workers in this field, and I myself stated in a previous paper (1943) that the gold-sol reaction is of little value in the diagnosis of schizophrenia. This statement, as you have just seen, has turned out to be wrong, after a more careful reading and evaluation of the test had been carried out.

The results obtained by the examination of the C.S.Fs. of typical schizophrenics by the use of the M.T.R. and Lange curve agree very well with those obtained by Kafka and Samson (1928), and by Neel and his collaborators (1933), using other methods. It means that the application of four different methods in examining the C.S.F. has proved that there are changes present which are not found in neurotics or typical manic depressives. I am a little reluctant to explain the nature of these changes, but after all we know they are indicative of a qualitative and/or quantitative disturbance in the so-called albumin-globulin ratio. Similar changes in the C.S.F. are very often found in degenerative processes of the central nervous system, and as you know, it has been claimed by various authors that slight disturbances of such a nature occur in the brains of schizophrenic patients. This has not been generally acknowledged. One objection is that cell atrophies of such kind are of a non-specific nature, and might have been caused by former illnesses or the disease preceding the death of the patient. I do not want to raise again the problem of specific and characteristic in this respect, and I am not a histopathologist, but I should like to mention that Kirschbaum and Heilbrun (1944) have just published a paper on pathological changes in the brains of schizophrenics where they think that the changes are not due to previous or intermittent disorders. So, even if the pathological deviations in these cases may not be of a so-called

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"specific" nature, they have at least been obtained from brains of otherwise healthy schizophrenics. There is therefore a possibility that such findings on the brains and those obtained on the C.S.Fs. of schizophrenics have some connection with each other if they should be confirmed.

I wish to thank Dr. O. FitzGerald, Medical Superintendent of Shenley Hospital, for his encouragement to carry out these investigations and to publish the results.

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Part II.—Review.

The Modern Prison System of India. By Lt.-Col. F. A. BARKER, I.M.S.(retd.). London: MacMillan & Co., 1944. Pp. xvi +139.

Dr. Barker describes the progress of prison reform in India during the twenty years which followed the publication of the Report of the Indian Jails Committee, 1919–1920. His material is compressed into eighteen short chapters, which contain a great deal of interesting information. Little space is allotted, however, to the Medical Service, and the problem of mental abnormality and crime is discussed only in the barest outline. The author refers to "moral imbeciles" although the term has been expunged for many years, and many prison psychiatrists will disagree with him when he assumes that trained psychologists are the appropriate technicians to "seek out and treat" the unknown number of offenders "whose mental state will almost certainly progress to insanity or crime." Surely, there can be no doubt that problems connected with mental diagnosis and psychiatric treatment, with responsibility and culpability, are primarily matters for psychiatrists if catastrophes in criminal cases are to be avoided. Particularly so, perhaps, in a country which, according to the author, "has as yet hardly begun to tackle the problem of the definitely insane."

An appendix dealing with certain features of criminality in India has special medical interest. Sir Louis Stuart, a former Sessions Judge in India, discusses the various types of homicidal offences in a clear and practical manner. Mr. A. Campbell, formerly a High Court Judge at Lahore, writes interestingly on Thuggi, the making of a modern dacoit, and the Indian Criminal Tribes.

In spite of its medical limitations, the book is an important contribution to the general study of prison systems. It is hoped that its reception will encourage the Department of Criminal Science, Faculty of Law, Cambridge University, to issue without delay further volumes on the prison systems in different parts of the British Commonwealth of Nations.

W. NORWOOD EAST.

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* A number of abstracts in this section are reproduced from *Psychological Abstracts*. To the Editor of this Journal we extend our grateful thanks.

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Consideration of the Relationship of Primary and Secondary Mental Deficiencies, Convulsive Disorders, Avitaminosis, and Alteration of Electro-neuronal Potential. *Cook, G. H.* 166
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Heredity in the Functional Psychoses.

To date four methods have been devised for the study of heredity. The first is Galton's family history method. Several generations of clinical experience have shown that this method is fallacious because mere observation alone cannot differentiate hereditary from environmental causes. On the basis of their fallacious statistical studies, the Galtonians have come to incorrect conclusions, such as the inheritability of rickets, tuberculosis and pellagra. It is evident that the mere recurrence of a certain trait in the same family does not prove that trait to be hereditary. This follows automatically from the fact that members of the same family have similar environments. Unfortunately, this obsolete family history method is often used to-day. The second method was introduced by Mendel. This is a purely experimental technique which necessitates pure stock for the parent generation, a completely controlled environment, inbreeding of brother and sister and a sufficiently large number of F2 progeny to bring out the characteristic Mendelian ratio. Only by the experimental demonstration of the F2 ratio can this method prove a character to be hereditary. For functional psychoses none of the conditions necessary for a Mendelian experiment can be achieved in human beings. The method, therefore, can give us no information as to whether or not these psychoses are inherited. The third method widely used for the study of heredity in mental diseases is the combination method. This method seeks to find the characteristic F2 Mendelian ratios in family histories. We have seen that these ratios appear only in certain stages of a very highly specialized experimental technique. Occasionally a characteristic ratio can be found in simple 1-gene diseases like Huntington's chorea and polydactyly. It is a grave error to reason from this analogy that the discovery of a characteristic ratio in a few families necessarily proves the character to be hereditary. A casual inspection of family histories of mental patients shows that no such simple mechanism could possibly be involved. Goddard's classical error of trying to prove feeblemindedness to be hereditary by this method is a typical example of the uselessness of the method for psychiatric disorders. The fourth method is the study of the mental status of twins. Although the heredity is the same in identical twins, the mere discovery of two twins with the same mental disorder does not prove the mental disorder to be hereditary. Since twins are more likely to have similar environments than are ordinary individuals, similarities in environment seem to be the cause of such simultaneous appearance of functional psychoses. If heredity were the cause of the psychosis, it would be impossible for only one twin to be affected. In Rosanoff's study of 41 pairs of identical twins, only one twin was affected in 32 per cent. of the pairs. This is substantial evidence against a hereditary etiology of schizophrenia. The other three groups of cases summarized are ordinary siblings. They have identical hereditary relationships. The declining double schizophrenia rate in these three groups (20 per cent., 10 per cent., 3 per cent.) must be due to environmental difference.

(Author's abstr.)

Electroencephalographic Studies Immediately Following Head Injury.

1. If mild cerebral trauma such as we were investigating produced changes in the electroencephalographic tracing, the abnormality disappeared within a period of minutes in the vast majority of cases.

2. Patients who gave a history of amnesia following cerebral trauma, but were clear mentally at the time the EEG was taken, showed only slight increase in the percentage of abnormal records as compared to the control series. This was true even when the records were taken within a few hours of the accident.

3. If there was an impairment of consciousness of any degree at the time the EEG was taken, abnormality in the EEG was the rule.

4. Electroencephalographic records taken within 30 minutes after patients sustained head injury showed a greater percentage of abnormality than those taken after 30 minutes had elapsed. The rapid disappearance of abnormal electroencephalographic findings points, in our opinion, to some mechanism in concussion other than petechial haemorrhage, cerebral contusion, embolic phenomenon, or any other histo-pathological change which must of necessity require several days to disappear.

5. In the patients with abnormal electroencephalographic records the average velocity of the striking object or of the falling head at the time of impact was greater than the velocity necessary to produce concussion in experimental animals as determined by others. The average velocity of the striking object or falling head in patients who showed normal or borderline electroencephalo-

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graphic records was less than the velocity necessary to produce concussion in experimental animals.

6. The study of the electroencephalographic records taken immediately following mild head injury was less reliable than clinical judgment in predicting time loss from work. An ultimate opinion of the value of EEGs in this respect will depend upon a study of a group of more severely injured patients. (Authors' abstr.)

Experimental Chronic "Epilepsy" in the Baboon and Epileptiform Seizures in the Dog, Rabbit and Guinea-pig.

Experimental chronic "epilepsy" has been produced in the baboon and African green monkey by a single application of alumina cream to the motor cortex. After a clinically free period, reactions first occurred 7 weeks and 3 months respectively after operation. These observations parallel the results obtained previously in a large series of *rhesus* monkeys.

Rabbits similarly treated reacted 3–4 weeks after operation with acute convulsive attacks of short duration.

Recurrent epileptiform seizures were induced in the guinea-pig following an intra-cerebral injection of the same material. The convulsive pattern differed from that observed in the primates. Dogs and cats failed to respond to the cerebral application of alumina cream. However, alumina A caused immediate acute convulsions in dogs, but produced no seizures in cats. (Authors' abstr.)

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Neurosis and Alcohol.

Sixteen cats were trained to adapt to situations of increasing complexity; first they opened a box of food, then they were taught to feed only after specific sensory stimuli, and finally they learned to manipulate a switch in various positions to actuate their own feeding signals. When alcohol was administered, these patterns disappeared in the order of decreasing complexity of integration, until only the original, primitive feeding reactions remained. After recovery the animals were subjected to a severe motivational conflict, and developed inhibitions, phobias, loss of dominance, somatic manifestations of anxiety and other behavioral abnormalities typical of an experimental neurosis. Alcohol partially disintegrated these complex responses, restored direct goal-behavior and thereby temporarily relieved the neurosis. Ten of the animals, after sufficient experience with this effect, continued to prefer alcohol to non-alcoholic liquids until their neuroses were relieved by various experimental procedures. The significance of these findings with regard to the psychodynamisms and therapy of alcoholic addiction in man is briefly discussed. (Author's abstr.)

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A Contrast between the Electrocenephalograms of 100 *Psychoneurotic Patients and those of* 500 *Normal Adults.*

1. The EEG of the psychoneurotic patient shows no gross abnormalities of wave pattern and in general falls within the normal range.

2. Nevertheless, a study of the findings on a group of 100 psychoneurotic patients reveals that their electroencephalographic data lie only just within the range for normals, and that the distribution of their data is statistically different from that of a group of 500 normal adults.

3. The statistically significant differences between the total psychoneurotic group and the normal group were in the following characteristics of the EEG:

(*a*) The distribution curve of dominant frequencies in the psychoneurotic group was not that of a normal population.

(*b*) The incidence of beta activity (18·0 cycles and over) was higher in the psychoneurotic group than in the normals.

4. The clinical subgroup diagnosed as anxiety neurosis had a normal distribution curve for dominant frequencies, but in a range faster than normal (mean 11·2 for anxiety neurosis as against 10·6 for normals.)

5. A discussion is presented of the possible physiological mechanism which may be responsible for these findings. (Authors' abstr.)

A Seven-Year Survey of Insulin Treatment in Schizophrenia.

In our experience insulin has been of definite value, but by no means as effective as the early enthusiastic reports led one to believe. Lately this seems to be the impression gained by others too. Several findings are of significance: (1) Worthwhile results are obtained only in cases of a duration up to 1 and 2 years, and possibly 3 years. (2) The treatment causes quicker remissions. (3) 73 per cent. of the patients paroled 6 years ago have been returned to the hospital. (4) Age of the patient and the type of schizophrenia are not significant factors. (5) The number of treatments given and comas produced bear no constant relation to the results obtained. In other words, increasing the length of treatment and number of comas does not increase the parole-rate. The author's firm impression is that if a patient does not show *definite* improvement by the time he has had 25 to 30 treatments and half as many comas, he will not become sufficiently well to be paroled no matter how many further treatments and comas he receives. Any improvement that does occur will be fleeting in nature. (6) Good remissions may be obtained with as few as 15 to 20 treatments and relatively few, if any, comas.

These facts indicate that the last word has by no means been said in the treatment of the functional psychoses. Although we know some of the physiological effects of insulin, its *modus operandi* as a therapeutic weapon in schizophrenia is unclear. Much work has yet to be done on the psychological and physiological aspects of schizophrenia, and insulin treatment can help along *both* these lines. The writer believes that the psychologically therapeutic aspects of the treatment need closer scrutiny. Many of the facts lead to the conviction that it is not merely insulin-hypoglycemia that counts, but the specific *insulin-treatment-situation* which does. The fact that principally cases of short duration do so well is understandable only from this point of view. These patients are close enough to reality to respond to the treatment-situation, whereas the others are so withdrawn and psychologically fixed that the very same drug can have little or no effect. This has led to the conclusion that if the patient does not respond within 25 to 30 treatments, he cannot meet the situation. No amount of similar treatment thereafter will help him. This need not produce pessimism in us. Rather, we may direct our research efforts into channels which discover the nature of the character-structure of those patients who respond favorably, the meaning this particular treatment-situation has for patients generally, and the type of treatment-situation which may aid those not benefited by the insulin-treatment situation. (Author's abstr.)

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A Comparative Study and Evaluation of Electric Shock Therapy in Depressive States.

A group of 70 patients with various forms of depression have been reviewed for immediate as well as late therapeutic achievements with electric convulsive shock treatment, the efficiency of which was considered with reference to several standard criteria, chiefly derived from experiences in a clinically comparable group of 68 control patients. This study led to the following observations on the value of electric shock therapy:

1. The improvement rate was 30 per cent. and the recovery rate 44 per cent. higher with than without shock therapy, whereas the increase rate of relapses or failures during the first year after discharge was almost twice as high in the controls as in the treated group of patients.

2. Marked improvement or full recovery is at times accomplished in chronic depressions of completely disabling degree, where inherent trends toward remission are apparently lacking.

3. Spontaneous remissions are markedly enhanced in degree and quality of improvement.

4. The length of a depressive episode and the need for hospitalization are reduced by 75 per cent. to 90 per cent. of the computed average duration in untreated attacks.

5. A maximal therapeutic gain of 52 per cent. was achieved in involutional melancholias. This gain is especially impressive if one takes into consideration that this form of depression has the least favourable prognosis among the various diagnostic types and without shock therapy.

6. The commonly discussed prognostic indicators regarding the outcome of shock therapy appeared too inconsistent in their implications, and insufficiently explored in detail to be adequate for practical clinical considerations.

7. Manifest untoward effects of electric shock therapy are relatively insignificant as compared to the therapeutic gains. (Authors' abstr.)

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Cerebrospinal Fluid Pressure under Conditions Existing at High Altitudes: A Critical Review.

There is no evidence that reduced atmospheric pressure itself has any influence on the intracranial pressure.

The expansion of gas in the bowel at reduced atmospheric pressures may cause increases in intracranial pressure secondary to a rise in venous pressure.

Anoxia due to breathing air at reduced atmospheric pressure may cause increased intracranial pressure as a result of the production of cerebral edema.

The increase in arterial blood pressure due to the anoxia of high altitudes may be a possible factor in the initial increases of intracranial pressure.

Changes in the rate of production or of absorption of cerebrospinal fluid under conditions of anoxia may serve to compensate against increases in intracranial pressure produced by the mechanisms listed in the preceding three paragraphs.

Increases in intracranial pressure observed in studies on man and on experimental animals subjected to high altitudes have not been of such magnitude as to give them great clinical significance.

For the proper investigation of intracranial pressure at various altitudes, the following factors should be studied quantitatively: (*a*) Venous pressure; (*b*) presence of abdominal distension; (*c*) oxygen tension in the gas mixture breathed; (*d*) oxygen saturation of the blood; (*e*) cerebrospinal fluid pressure, determined with a manometer of not more than 1 mm. bore; (*f*) in animal experiments, amount of cerebral edema due to anoxia; (*g*) chronicity of the anoxia, and (*h*) in experiments on man, emotional response and bodily relaxation, and, in experimental animals, relaxation as influenced by the depth of anesthesia.

Experimental evidence as it appears in the literature indicates that significant increases in the intracranial pressure will not occur in the sick or wounded during transportation by air provided anoxia is not permitted to develop. (Authors' abstr.)

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Pathology of Demyelinating Diseases as an Allergic Reaction of the Brain.

Up to the present the difficulty in the evaluation of the pathologic process of demyelinating diseases has centred, in the author's opinion, around four factors: (1) A tendency on the part of investigators to create easily new clinical or pathologic entities; (2) lack of discrimination between chronic and acute pathologic changes; (3) individual tendencies to be dogmatic in interpretation of the vascular reaction and labelling of the pathologic process as inflammatory or degenerative; and (4) lack of experimental support for the establishment of a link between an acute and a chronic pathologic process on the basis of vascular reaction.

1. The tendency to create easily new clinical and clinicopathologic entities has been particularly evident in the field of the demyelinating diseases. In a tentative classification, published in 1937, the author attempted to eliminate a considerable amount of confusion centred around a multitude of processes for which various names had been coined. The confusion stimulated by the creation of Schilder's disease included the diseases which bear the names of Devic, Balò, Krabbe, Foix and Alajouanine and Pelizaeus and Merzbacher.

The new nomenclature, including such terms as centrolobar sclerosis, encephaloleukopathia scleroticans, leukodystrophy, degenerative subcortical encephalopathy, leukoencephalopathy myeloclastica primitiva and encephalomyelomalacia chronica diffusa, added confusion to a point at which neither the clinician nor the neuro-pathologist could see his way clear.

Minimal clinical or pathologic deviations cannot constitute grounds for the creation of new clinicopathologic entities when one takes into consideration the variations related to the acuteness or chronicity of the process, the age of the patient and the individual resistance of the nerve tissues. Unfortunately, these factors have often been minimized and new clinicopathologic entities soon added to express what presumably were only various aspects of the same fundamental process.

2. A second source of error in the interpretation of the pathologic features of demyelinating disease has been the lack of sufficient discrimination between the acute and the chronic changes of the process. It goes without saying that the pathologic characteristics of an acute lesion may not be the same as those of the chronic lesion. Too often the difference in the pathologic features supposedly existing between an acute and a chronic demyelinating process is based on disregard of the fact that in the acute stage of demyelinating disease the process is in its development, whereas in the chronic stage important transformations of some reactions, in addition to the process of repair, may have taken place.

On the other hand, one must not forget that even in the course of typical multiple sclerosis phases of reactivation may occur, expressed in terms of both clinical and pathologic exacerbation. A study of the so-called fresh areas of demyelination which develop in the course of chronic sclerosis reveals the same histologic features observed in the acute processes of demyelination, ranging from pathologic changes of the blood-vessel walls and perivascular exudate, in which both lymphocytes and compound granular corpuscles are represented, to thrombi, hemorrhages and necrosis.

3. The third point of controversy relates to the interpretation of a pathologic process as inflammatory or degenerative. Here, again, the individual variations determined by the intensity and the duration of the pathologic process must be considered. Variations in connection with the intensity of the process are to be expected. In cases of dementia paralytica with classic symptoms microscopic examination has revealed considerable variation in the intensity of the perivascular infiltration, the amount of exudate being enormous in some cases and only moderate in others. Degenerative changes have been proved to predominate over the inflammatory changes in the juvenile form of dementia paralytica, whereas perivascular infiltration predominates in the so-called fulminating form.

With demyelinating processes, also, one should not be surprised to find cases in which the perivascular infiltration is outstanding and others in which this feature is much less pronounced.

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Evidently the question may concern the degree of intensity of the same reaction, and not different pathologic processes.

To label a process as degenerative just because the perivascular infiltration is minimal means losing track of the process as a whole, and disregarding the important possibility that mild reactions may be dependent on the intensity of the pathologic process and on the individual tissue resistance. In addition, the age of the process must play a part in the histologic appearance of the lesion. The paucity of perivascular reaction in the so-called chronic stage of epidemic encephalitis is familiar to all.

One solution of the difficulty in interpretation of the presence of perivascular exudate has been to include this reaction under "symptomatic inflammation." In this term the various authors have found an escape from, rather than an explanation for, the presence of a perivascular reaction associated with a lesion of supposedly degenerative nature.

How intense this symptomatic type of perivascular reaction should be to qualify for such a label has been left entirely to the individual investigator, no satisfactory standard having been set. Thus, study of the same histológic slide by two different pathologists might result in the diagnosis of the same process as inflammatory by one and as degenerative by the other. On the other hand, one must keep in mind the fact that in demyelinating disease there is no parallelism between the inflammatory reaction and the intensity of the degenerative changes. The perivascular infiltration is encountered in areas in which little or no substantial degeneration of the parenchyma is noticeable, not to mention the frequent presence of exudate in the meninges in areas not related to underlying degeneration.

It is disturbing that the same reaction can be interpreted as the result of two basically different processes. Such elasticity in the interpretation of the pathologic process leading to two opposing concepts of the same process may have resulted from lack of knowledge of a possible common link which would permit evaluation on the basis of variations of the same process, rather than of fundamental differences. Such a link might be furnished by the studies on experimental cerebral anaphylaxis. The comparison of this pathologic process to that of demyelinating diseases suggests, in the author's estimation, that a common denominator in the pathologic features may be found in an allergic reaction of the nerve tissue.

The pathologic changes associated with experimental cerebral anaphylaxis briefly reported in this paper have been utilized here as a comparative standard for the evaluation of the pathologic process of demyelinating disease. Emphasis has been placed on the analogy of the two conditions, with a view to establishing a possible common physiopathologic reaction.

It is true that one seldom observes with demyelinating diseases the outstanding hemorrhages typical of the Arthus phenomenon. One must, however, remember that such hemorrhages are characteristic only of the very acute and the very early stages of the reaction. It is also true that polymorphonuclear elements have rarely been reported in the perivascular exudate of demyelinating diseases, but one must remember that the leukocytes begin to disappear as soon as a few hours after the onset of the anaphylactic reaction, and that gradually the polymorphonuclear cells are substituted by lymphocytes. Practically no leukocytes are present in the later stages, when the reaction has changed from a polymorphonuclear-hemorrhagic to a lymphocytic-histiocytic type.

4. In the acute, experimentally induced type of poliomyelitis the same changes occur. The exudate, which in the very early stages is formed of polymorphonuclear cells, changes into one of lymphocytes as the disease progresses. This change in the type of exudate is important, because cases of human poliomyelitis have been reported in which the exudate was formed by lymphocytes, and not by polymorphonuclear cells. But even in the absence of polymorphonuclear leukocytes Pette formulated the concept that preceding the stage of lymphocytic infiltration there presumably always is, in the severe type at least, a stage of polymorphonuclear infiltration. He, however, expressed the possibility that in cases of mild poliomyelitis the stage of leukocytic infiltration may fail to appear. In cases of acute demyelinating diseases in which autopsy is generally performed several days after the onset of the disease, one should not be surprised at the absence of leukocytic infiltration.

As for the rest of the pathologic picture, both with anaphylaxis of the brain and with demyelinating diseases, acute or chronic, patchy or diffuse, there occur the same fundamental processes of edema, lymphatic stasis, necrosis, lymphocytic-histiocytic reaction, giant-cell formation and repair.

None of these individual components of the histiologic picture, taken separately, constitutes a characteristic or is pathognomonic of the anaphylactic reaction. However, evaluation of the histologic picture as a whole, with consideration for all the various components, constant or inconstant, should ultimately determine its interpretation.

It is the author's impression that unification of the pathologic syndrome of demyelinating diseases appears plausible as the expression of an allergic reaction of the nerve tissue. This unification has in its support the opinions expressed by investigators that from a clinical standpoint the demyelinating diseases are simply the expression of variations of the same fundamental process and the clinical impression as to their allergic nature already expressed.

The analogy of the cerebral pathology of demyelinating diseases and the pathology of cerebral anaphylaxis will open new avenues to the interpretation of the pathogenesis and histogenesis of multiple sclerosis, diffuse sclerosis and the acute encephalomyelitides.

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The question arises now as to the factors responsible for the allergic reaction. The answer is difficult, especially in view of the fact that apparently different etiologic factors seem to result in the same clinicopathologic picture. The virus of vaccinia, of rabies, of measles, of influenza and of chicken-pox, as well as the streptococcus of scarlet fever, all seem to bring about the same results. If one wishes to speculate on recent statements that a protein molecule constitutes the central nucleus of certain viruses, one could here find a possible explanation of the identity in type of cerebral reactions precipitated by various viruses.

On the other hand, the antigen may not necessarily originate from an infectious process. Products of intermediary metabolism could speculatively be held responsible for the production of antigens. Accurate dietary and metabolic studies in cases of demyelinating diseases might lead to the finding of additional etiologic factors, in the direction of allergic reactions rather than in that of deficiencies. The predominance of multiple sclerosis in certain geographic areas might also center around common dietary factors.

Esotoxins or endotoxins of bacteria, which are at the basis of the so-called Shwartzman phenomenon, or phenomenon of local sensitivity, may, through the same mechanism, result in allergic involvement of the cerebral tissue.

The importance of contributory factors in precipitating or aggravating an allergic reaction of the brain would also find its support. Some of these factors have been investigated experimentally. The contribution of Vaubel, Knepper and Knepper and Waaler on the value of precipitating factors, such as fatigue and hyperventilation, the action of external agents, such as trauma, cold or heat, and the influence of endocrine products has demonstrated the importance of contributory factors in determining not only the intensity but the localization of the allergic reaction in certain organs.

Once the initial pathologic basis has been established in the brain, additional factors may play a role in the progress of the disease or in its phases of reactivation. The author refers to the possible development of antigen (anaphylactogens) from the white or from the gray matter. The studies of Bailey and Gardner have established that antigenic substances can be derived from myelin sheaths. That the brain has immunologic properties which make that tissue almost as organ specific as the lens of the eyes is known. The brain-specific antigens, or haptens, have been claimed by some authors to have the properties of lipids only, whereas other authors (Bailey and Gardner) expressed the belief that the antigen of brain broth may be either a polysaccharide complex or a protein derivative.

Interpretation of the pathologic process of demyelinating disease on the basis of allergy could clarify the still existing confusion as to the significance of the perivascular and histiocytic reaction, so often disregarded or minimized in the study of the cerebral pathology, and might offer a common ground for evaluation of the vascular reaction as a whole under the term " hyperergic inflammation," already coined by Rossle, or of " reactive allergic inflammation," which the author would like to propose.

Interpretation of the pathologic picture of demyelinating disease in the light of an allergic reaction does not exclude the histogenic origin of plaques through thrombus formation, as maintained by Putnam and his co-workers.

As far back as 1939 Putnam and Alexander, in discussing the cause of thrombus formation in demyelinating diseases, stated :

" The fact that similar ' encephalomyelitides ' may be provoked in animals by the injection of organ extracts and bacterial products furnishes a possible explanation for the post-infectious types. Some thrombi may be of ' allergic ' origin (Dietrich and Schroder, Alexander and Campbell). A great group remains, however, in regard to which there is no precise information."

In 1941 Putnam again expressed the view that the origin of encephalomyelitis is in some sense an allergic reaction, adding that " it seems not unreasonable to suppose that an instability of the clotting mechanism of the blood might be one aspect of allergy."

That interference with circulation of the blood is part of the allergic reaction has been established experimentally by Doerr, who reported that capillary and pre-capillary vessels react to anaphylactogen with changes in caliber (dilation and constriction) and with changes in permeability (edema and diapedesis).

Abell and Schenck, using the transparent chamber technic devised by Clark and co-workers, were able to compare the behavior of the arterioles, capillaries and venules of a normal rabbit with the corresponding vessels in the same rabbit after sensitization and injections of anaphylactogen. They observed that in a rabbit sensitized to horse serum, intravenous injection of this antigen may be followed by (*d*) arteriolar contraction with obliteration of the lumens of the arterioles and stoppage of the circulation, (*b*) increased adherence of leukocytes to the endothelium of the blood vessels and emigration of leukocytes through the walls of the capillaries and venules in large numbers, and (*c*) sticking of leukocytes to each other to form clumps or emboli, which block the circulation in many capillaries and venules.

In addition to thrombosis, allergy may produce vascular damage in the form of periarteritis, intimal hyperplasia, fibrinoid degeneration of the intima and media (Fox and Jones) and periarteritis nodosa (Vaubel, Rich and Gregory).

This vascular pathologic process, called hyperergic arteritis by Vaubel, and leading to reduction or occlusion of the lumen of the blood vessels, was also reported by Knepper and Waaler, in an article on functional hyperactivity of the lungs and heart in the course of experimental allergy.

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Vasospasm in the course of allergy was advocated by Gerlach and by Knepper and Waaler, and mechanical occlusion of capillaries resulting from surrounding edema was predicated by Gerlach.

It is certain that variability of the coagulation time accompanies allergic reactions. However, there seems to be a difference of opinion as to whether the coagulation time is shortened or prolonged (Urbach and Gottlieb). In the so-called hemoclastic crisis of Widal, there are, for instance, decrease in the leukocyte count, relative lymphocytosis, decrease in the amount of protein colloids, lowering of blood pressure and increase in coagulability of the blood.

The unification of the pathologic changes in the brain under the heading of allergic reaction would offer a new avenue of interpretation in the field of prevention and therapy of the important group of demyelinating diseases on an immunologic basis. In this connection, Horton, Wagener, Aita and Woltman, of the Mayo Clinic, have made a preliminary report of their attempts to treat multiple sclerosis, especially in the acute stage, with intravenous injections of histamine. The authors seem inclined to relate any recovery and improvement to vasodilatation in the central nervous system resulting from repeated injections of histamine. One could, however, speculate on another explanation of the beneficial effect of histamine, based on the work of Fell, Rodney and Marshall and of Cohen and Friedman on the production of histamine-specific antibodies by the use of histamine as a specific hapten conjugated by an inert protein carrier. In the experience of Fell and associates, histamine-specific antibodies were sufficient to prevent the anaphylactic shock resulting from intravenous injection of a shock-producing dose of protein. The prevention of the anaphylactic shock might be related to neutralization or destruction of the hypothetically liberated histamine. It is this explosive liberation of histamine which, according to Dale, is the cause of the anaphylactic shock. (Author's abstr.)

The Human Pyramidal Tract. X. The Babinski Sign and Destruction of the Pyramidal Tract.

1. The evidence appears to be overwhelming that the sign of Babinski can be elicited in persons with no loss of pyramidal tract fibers.

2. A small percentage of persons without any manifestations of neurologic disease may exhibit the Babinski sign on proper stimulation.

3. A temporary sign of Babinski can be produced in normal subjects under various conditions, as follows: (*a*) Severe exertion; (*b*) subjection to the action of depressant drugs; (*c*) spontaneous or induced hypoglycemia; (*d*) deep sleep; (*e*) blood disorders; (*f*) ingestion of certain toxic chemicals or poisonous gases; and (*g*) many miscellaneous conditions.

4. Many systemic or neurologic inflammatory diseases may cause a transient or fluctuating Babinski sign.

5. Pressure on the pyramidal tract almost invariably produces an extensor toe response, which may disappear when the cause of the pressure is removed. In some of the cases in this series no signs of descending degeneration in the pyramidal tract were apparent at autopsy.

6. Remote space-consuming lesions may produce a sign of Babinski through edema, anoxemia or other phenomena.

7. The mechanism involved in producing the sign of Babinski in disease conditions in man may be of a capricious nature. (Author's abstr.)

Electric Convulsive Therapy of the Psychoneuroses.

The question of the advisability of electric convulsive therapy of a psychoneurosis is far more difficult than the advisability of such treatment for the major psychoses. For the affective disorders and for schizophrenia the shock therapies are the only methods in general use, and the results are gratifying in a considerable number of patients. For treatment of the neuroses psychologic methods are available, and electric convulsive therapy would be indicated only if the results were superior. Statistical reports on the results of psychotherapy with the neuroses, regardless of the form used, seem to vary within narrow limits, as has been observed only recently with war neuroses. In most statistics on peace-time neuroses the percentage of patients showing improvement ranges between 60 and 70 per cent. when persons showing great improvement and those showing slight improvement are considered together. Our figures for electric convulsion therapy reach these values only for a few types of neurotic patients.

On the other hand, the results do not preclude the use of electric convulsive therapy in well-selected cases. The actual dangers of this method are so few that one is justified in discussing indications purely from the point of view of expected results. The following recommendations are made on the basis of clinical experience with the series of 65 neurotic patients presented in this paper.

Patients with anxiety neurosis should be excluded from treatment because they have the poorest chance of improvement. The same holds good for patients with conversion hysteria, for whom treatment is hazardous because they may react to unpleasant sensations during the treatment with the development of new symptoms. Only when such symptoms may substitute for a depressive episode or when psychotherapy has failed might electric convulsive therapy be tried. Extreme caution should be applied in the selection of patients, and the availability of a simple mechanical method should not prevent the psychiatrist from using a psychologic approach to the patient's psychologic problems.

The situation is different in the case of patients with a severe obsessive-compulsive neurosis

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of long standing. If such patients have lost their social usefulness and their joy of living and if adequate psychotherapy has failed, or cannot be afforded, an attempt with electric convulsive therapy is justified. A point in favor of the use of electric convulsion therapy is the possibility that neurotic symptoms are the first clinical expression of a psychosis. Occasional improvement in cases of obsessive-compulsive neuroses stimulates speculation regarding the relation of this condition to schizophrenia.

Psychoneurotic depressions should be treated in any case in order to clear the depression, even if the patient may remain neurotic. Many cases of an apparently reactive depression are actually cases of a manic-depressive psychosis, for which convulsive therapy is the treatment of choice. It is equally justifiable to treat the ill-defined neuroses of episodic character in which physical complaints and general listlessness are clinical expressions of an underlying depression.

The optimal number of treatments, satisfactorily determined in our experience for the various major psychoses, cannot easily be stated for the neuroses. In patients for whom treatment is intended mainly to relieve tension and to overcome resistance to psychotherapy, a series of a few treatments, with longer intervals and avoidance of confusional states, is preferable. For depressive syndromes the optimum will be six to eight treatments, as given for other depressions. For obsessive-compulsive neuroses twenty treatments, considered as a minimum in treatment of schizophrenia, are given in order to achieve at least temporary disappearance of obsessive thoughts and compulsions.

The authors' experience does not permit as clear a statement for or against electric convulsion therapy for the psychoneuroses as can be made regarding its value for the manic-depressive and involutional psychoses, as well as for acute schizophrenia. In general, the final results with neurotic patients are unsatisfactory. It may be stated, however, that careful selection of patients and well-planned application in combination with psychotherapy lead to fair results in a limited number of patients. The improvement does not resemble, either in type or in degree, that obtainable with a proper application of electric convulsive therapy with certain types of psychoses. (Authors' abstr.)

Electroencephalographic Evaluation of Psychopathic Personality : Correlation with Age, Sex, Family History and Antecedent Illness or Injury.

1. Fifty-four per cent. of a series of 68 patients with a condition diagnosed as psychopathic personality, for which no organic cause was suspected, had abnormal electroencephalograms, characterized principally by the presence of slow or very slow waves.

2. When the electroencephalograms were classified according to the Gibbs, Gibbs and Lennox scale and compared with the electroencephalograms of their groups of neurologic normal controls and epileptic patients, the distribution for the patients with psychopathic personality was radically different from the distribution for the other two populations.

3. Age and sex were unrelated to electroencephalographic abnormality.

4. Significantly greater proportions of abnormal electroencephalograms were found when there were both a positive family history (of psychosis, maladjusted personality, chronic alcoholism or epilepsy) and a personal history of cerebral trauma or severe illness than when neither of these factors was present. The statistical significance was not so great when only one of these factors was operating. However, the higher incidence of abnormal electroencephalograms associated with any one of these factors was probably not due to chance. (Authors' abstr.)

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Mental Symptoms Following Head Injury: A Statistical Analysis of Two Hundred Cases.

Of a group of 200 patients, post-traumatic mental symptoms developed after head injury in 31·5 per cent. A number of extrinsic and intrinsic factors were examined in relation to the development of these symptoms. Pretraumatic factors having a high incidence of post-traumatic mental symptoms were advancing age, the married status in men, certain national stocks, certain occupations, the type of injury and, among the psychiatric disturbances, pretraumatic symptoms based on anxiety. Post-traumatic factors having a high incidence of post-traumatic mental symptoms were the initial occurrence of coma and post-traumatic amnesia, certain accompanying injuries, a prolonged stay in the hospital and the presence of headaches and dizziness. In particular, prolonged duration of headaches and dizziness was associated with a high incidence of mental symptoms. Other physical sequelae of the injury lasting more than six months had an equally high incidence of mental symptoms (73 per cent.). Post-traumatic nightmares were regularly associated with additional symptoms of anxiety. In addition, certain environmental complications, occupational difficulties in particular, and problems of litigation and compensation were correlated with a high incidence of post-traumatic mental symptoms.

Of the patients with post-traumatic mental symptoms, the largest group, 48 patients, had post-traumatic anxiety states. Twenty-three of these patients had previously normal personalities, whereas the remainder had pre-existing psychiatric liabilities. In all but one of these 48 patients the issue was complicated by environmental difficulties, such as occupation, litigation, etc.

The post-traumatic neuroses of all but 3 of the 26 previously normal patients conformed to the picture of anxiety neurosis. The psychiatric syndrome in patients with pretraumatic psychiatric complications varied through modification of the pre-existing condition, although 19 of the 26 patients presented predominantly anxiety symptoms.

Whereas anxiety symptoms were the predominant mental feature in the post-traumatic neuroses, particularly neuroses in previously normal patients, symptoms of personality change only, such as euphoria, moodiness and apathy, in addition to changes in the intellectual status, were presented by 7 patients with severe head injuries.

Mental symptoms, particularly symptoms of anxiety, are, with headaches and dizziness, the commonest symptoms in convalescence. They are also the most common symptoms relating to disability and are undoubtedly the major cause of disability, in particular of prolonged disability. A number of factors enter into the production of such anxiety symptoms, the most direct being reproduction of fears related to the injury and accentuation and elaboration of pre-existing conflicts in relation to occupational and financial questions. The latter factor accounts for the delay in onset of mental symptoms observed in several patients until they had recovered physically and were again faced with their obligations. (Author's abstr.)

Delirium. III. Electroencephalographic Changes Associated with Acute Alcoholic Intoxication.

Acute alcoholic intoxication was induced in 7 normal subjects with normal electroencephalograms, and in 4 subjects with chronic alcoholism who had occasional convulsions associated with drinking bouts and whose control electroencephalograms showed abnormally fast or slow activity. The distribution of frequencies was determined, and, in addition, the mean frequency was calculated. In all instances the development of intoxication was accompanied by progressive slowing of the brain waves, but the degree of slowing proved a more reliable index than the development of any particular wave frequency. Expressed in terms of mean frequency, gross intoxication was associated with a change in mean frequency of two to three cycles per second. When the pre-intoxication record was fast or fast normal, the record obtained during gross intoxication had a frequency distribution within the normal range (8 to 12 waves per second) and contained no frequencies below 7 waves per second. Indeed, some abnormally fast records became more " normal " during intoxication. With recovery the electroencephalogram returned to the preinduction status. A close correlation was demonstrated between the electroencephalogram and the level of consciousness, but not with the more personal aspects of behavior.

(Authors' abstr.)

Action of Barbiturates on the Cerebral Cortex: Electroencephalographic Studies.

In this study the electroencephalogram has been used in an attempt to elucidate the mechanics of cortical cell respiration *in vivo*.

One of the barbiturates—sodium amytal (in 20 experiments), sodium pentothal (in 50 experiments) and sodium pentobarbital (in 2 experiments)—was given intravenously to 32 patients.

For every subject to whom the barbiturate was given the electroencephalogram showed the development of high voltage fast activity.

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In the patients who received larger doses per kilogram of body weight a second effect developed; this consisted of slow delta waves (3 to 4 per second).

In every subject the high voltage fast activity appeared first in the frontal leads, then in the parietal leads and finally in the occipital leads, and it disappeared in the reverse order. In other words, the regions of the cortex which are the most recent in phylogenetic development are most vulnerable to the action of barbiturate, as evidenced by the electroencephalogram.

In the first few minutes of injection, at the stage of maximal action of the drug, the patient may be unconscious without the appearance of any of the brain waves typical of sleep. At a later stage the patient may sleep deeply under the influence of the drug, at which time the electroencephalogram may show typical waves for normal sleep, but on the patient's arousal it will revert to the high voltage fast activity specific for the barbiturate. (Authors' abstr.)

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Interpretation of Findings in the Cerebrospinal Fluid: (1) *The Dementia Paralytica Formula and the Necessity of Its Quantitative Differentiation.*

The formula as encountered in cases of typical untreated dementia paralytica is one of the most distinctive and important diagnostic findings concerned with the cerebrospinal fluid. It provides the main prognostic differentiation of neurosyphilis, possibly in early asymptomatic stages. Qualitatively, it is characterized by the combination of a positive reaction of syphilis and a dementia paralytica (parenchymatous) colloidal gold curve and, quantitatively, by a strength of all reactions which is unrivalled by other forms of neurosyphilis. From the practical standpoint its varying resistance to specific therapy is most significant.

A correct evaluation of the dementia paralytica formula requires the elimination of "false dementia paralytica curves," due either to confusion with first zone curves or to an unsatisfactory pH of the milieu. The qualitative differentiation of the dementia paralytica curve from all other types of curves is based on the presence of an abnormal pseudoglobulin-like "dementia paralytica substance," indicating extensive parenchymatous degeneration. This explains the grave prognostic significance of any dementia paralytic curve, irrespective of whether it is encountered as an element of the dementia paralytica formula or as part of the "syndrome of multiple sclerosis."

When quantitatively standardized methods are used, particularly in the determination of total protein and in the colloidal gold test, striking quantitative differences in dementia paralytica formulas are demonstrable. Of cerebrospinal fluids that were submitted for control of treatment, only about one-third yielded "true dementia paralytica formulas, as encountered with dementia paralytica," and two-thirds were notably weaker. Whether a true dementia paralytica formula, detected in the early asymptomatic stage, means prospective development of the disease cannot be determined; besides, the question is comparatively irrelevant. At the moment of the detection, the problem of the presumptive resistance to antisyphilitic treatment is paramount, since it determines the selection of adequately intense therapy. The direct determination of this resistance by follow-up examinations may involve a waste of time and money.

Without premature conclusions, the results of quantitative methods suggest that the resistance to antisyphilitic treatment roughly parallels the strength of the dementia paralytica formula, which is best expressed by the total protein concentration. It is suggested that the current qualitative concept of the dementia paralytica between this formula and its varying resistance to therapy on the basis of quantitatively different types be studied.

(Authors' abstr.)

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Prefrontal Lobotomy in Treatment of Chronic Psychoses, with Special Reference to Section of the Orbital Areas Only.

In a series of 22 patients with mental disorders, chiefly paranoid schizophrenia, a satisfactory therapeutic result was obtained with a modified technic of prefrontal lobotomy, in which only the orbital areas were sectioned.

The orbital areas of the frontal lobes seem to have a role in regulation of the emotions. (Authors' abstr.)

Electroencephalographic Evaluation of Primary Behavior Disorders in Children: Correlations with Age, Sex, Family History and Antecedent Illness or Injury.

1. As has frequently been shown, there is a high incidence of abnormality in the electroencephalograms of children with primary behavior disorders. In the present series of 67 children, none of whom presented signs of organic disease or in whose condition an organic etiologic factor was suspected, 49 per cent. had electrical brain potentials which were clearly abnormal.

2. Age and sex were unrelated to electroencephalographic abnormality.

3. Significantly greater proportions of abnormal electroencephalograms were found when there was either a history of psychosis, maladjusted personality, chronic alcoholism or epilepsy in the family or a personal history of cerebral trauma or severe illness than when neither of these factors was present. (Authors' abstr.)

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Mental Organization and Age Level.

1. The purpose of the study was to investigate the hypothesis that intelligence is relatively generalized in young children, but that as age increases there is a gradually increasing specialization of mental abilities, which should result in a decrease in the correlations between tests of different group factors and an increase in the correlations between tests of the same group factor.

2. In order to test this hypothesis a battery of eight tests, consisting of three tests of verbal ability, two tests of number ability, two tests of memory and one test of spatial relationships, was administered to children of three different age levels—9, 12 and 15 years. Correlations between the tests at each age level were computed for boys and girls separately.

3. The average correlations showed an increase from 9 to 12 years and a decrease from 12 to 15 years. The boys showed a sharper increase than the girls, and the girls showed a sharper decrease than the boys.

4. In conformity with the data the original hypothesis was amended as follows: Beginning with a minimum of integration at birth, there is a gradual increase in integration of mental ability, which reaches a maximum at approximately 12 years of age, after which there is a decrease in relationship due to the crystallizing out of group factors. It was suggested that the increasing integration is related to an increase in the stability of attitudinal influences, such as attention and interest.

5. The failure to obtain increases in the intragroup correlations with increasing age was attributed to the difficulty of obtaining tests of pure group factors, inasmuch as all the tests included varying amounts of other factors in addition to the one to be tested. Furthermore, the abilities employed in the performance of any task have been shown to vary with age, with the difficulty of the task, and even with the structure of the relationships among primary abilities in mental organization: (Author's abstr.)

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A Study of Personality Syndromes.

In accordance with the distinction drawn between the parameters and the variables of personality eleven "general traits" defined by Murray (6) were subjected to a *syndrome analysis of parameters* for two groups of subjects. Group A consisted of 28 college men; Group B of 41 private school-children.

There are five basic steps involved in performing a syndrome analysis:

(1) Calculating a complete table of intercorrelation of the measures.

(2) Selecting an arbitrary value of r to represent the minimum acceptable r for inclusion of a measure in a cluster. This may be labeled $r_{min.}$, and in the examples above was ·50 for Group A and ·40 for Group B. With relatively small samples it is convenient to select a value near the 5 per cent. or 1 per cent. levels of significance.

(3) *Preliminary clusters* are defined by the following criteria:

(*a*) Every measure in a cluster correlates $r_{min.}$ or more with every other measure in the cluster.

(*b*) No measure not in the cluster correlates $r_{min.}$ or more with *every* measure in the cluster.

(*c*) No cluster is completely contained in another cluster. (This follows automatically from the first two criteria.)

(4) The highest 25 per cent. of the subjects and the lowest 25 per cent. of the subjects are selected on each of the preliminary clusters, using the average of the scores on the component measures to select the "high" and the "low" subjects, provided that the several scores are homogeneous. The selection of these extremes should not be construed as "proving anything by extremes" since one half of the subjects fall into these categories. Its purpose is to aid in combining similar clusters *after eliminating subjects with idiosyncratic collections of ratings.*

(5) *Preliminary clusters which define approximately the same "high" and "low" subjects are combined to form the final syndromes.* In order for two clusters to be combined, at least 75 per cent. of the extreme subjects on one must be extreme in the same direction on the other, and *no* subject may be "high" on one cluster and "low" on the other.

Four syndromes were identified in Group A and five in Group B. Of these, four in the latter group correspond very closely to those in Group A, the fifth being of doubtful significance. These syndromes of the general traits, considered as parameters of personality, were defined at both ends of the scale:

I. *Imaginative, creative introversion* vs. *Practical, conventional extraversion.*

II. *Creative expressiveness* vs. *Apathetic conventionality.*

III. *Unorganized expressiveness* vs. *Organized perseverance* (among the College men of Group A) or *Apathetic withdrawal* (among the children of Group B).

IV. *Disorganized emotionality* vs. *Organized control.*

Differences between the syndromes in Group A and those in Group B were discussed briefly in the light of the differences in age and in educational environment. The discussion serves to illustrate (*a*) that differences between groups may be expressed in the *patterning* of the parameters of personality, and (*b*) that a single aspect of personality becomes more meaningful when it is embedded in a context of related aspects of personality. Thus, for example, syndromes I and II are both *creative*, the first being *imaginative and introverted*, the second, *expressive* and outward-going. Syndromes II and III are both *expressive*, the first being *creative*, the second, *unorganized*—probably together with a lack of creative capacity and opportunity. Syndromes III and IV both have to do with *organization*, the first describing a *lack of organization* in behavior the second, *disorganization* in behavior. The several syndromes in which a single measure may appear must be carefully considered for an understanding of the complexities surrounding the elements of personality. (Author's abstr.)

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The Minnesota Multiphasic Personality Inventory. V. Hysteria, Hypomania and Psychopathic Deviate.

The general method of deriving the scales and the general nature of criterion and test groups are described briefly for the three scales intended for use in identifying hysteria, hypomania, and the psychopathic deviate. The classification used is based on clinical syndromes recognized in current psychiatric practice. For each of the three scales the authors have presented evidence concerning validity and reliability of the scale, the scale items and the answers keyed as symptomatic, the mean score and standard deviation obtained for normal subjects, and the correlations

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obtained with both normal and psychiatric cases between the given scale and the seven other scales included in the Minnesota Multiphasic Personality Inventory.

G. R. THORNTON (Psychol. Abstr.).

A Note on the Clinical Use of the Hunt Minnesota Test for Organic Brain Damage.

The Hunt-Minnesota Test for organic brain damage has been applied clinically to 68 patients. The results, when compared with the final clinical evaluation, agreed in 54 cases, disagreed in 7 cases, and were invalid in 7 cases because of poor co-operation, etc. On the basis of clinical experience with the test, comments are made concerning use of the shortened form, the relationships of age and vocabulary status to scores on the test, the use of the interpolated tests as indicators of poor co-operation and the like, cases involving brain damage occurring before attainment of maturity, repetition of test, remission of deterioration, relation between intellectual deterioration and various types of brain damage, and vocational and psychiatric prognosis of cases with mild deterioration.

G. R. THORNTON (Psychol. Abstr.).

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Experimental Catatonia in Rats Produced by Centrifugation.

Centrifugation catatonia of rats presents a whole gamut of motor signs exactly as when the syndrome was brought about either chemically or by other means. The lowest doses of centrifugation produced hypokinetic signs; the increase of the dose the same signs, sometimes with the addition of hyperkinesis. The occurrence of convulsive seizures and death after overdosage was also in accordance with findings in other kinds of experimental catatonia.

Post-mortem examination of the brains of animals which were centrifuged to death showed signs of hyperemia, swelling and hemorrhages inside and outside the brain with varying localizations.

(Author's abstr.)

Oscillographic Studies of Bulbocapnine Tremor and Catalepsy in Macacus Rhesus.

Tremor in experimental catatonia induced by bulbocapnine in a *Macacus rhesus* was studied. Although the rate of the tremor pointed to an involvement of the basal ganglia, it was emphasized

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that this fact is insufficient to permit an identification of the picture of bulbocapnine intoxication with the Parkinson syndrome. Essential differences from the latter exist, and only identification with the human catatonic syndrome accounts for all the symptoms induced by bulbocapnine in the animal series. Electromyography by means of the ink-writing oscillograph confirmed the conception of active immobility of the cataleptic muscles. (Authors' abstr.)

An Investigation of After-images.

The after-image behavior of over 700 young subjects was studied, using with some subjects the "blink" method with the dark-adapted eye, and with others the fixation of pictures after the technique of Kluver. A grading scale was worked out in order to classify subjects according to their after-image performance. The present investigation revealed nothing to substantiate the claim that some special "eidetic" ability exists. After-image ability of a marked degree might be termed "eidetic," but it should not be implied that any sharp difference exists between so-called eidetikers and non-eidetikers. After-image abilities of a random group of subjects appear in a continuum. It is highly improbable that there is, as Kobusch says, a continuum of steps between the pure eidetic image and the pure memory image. The eidetic image is merely a vivid after-image, due probably to persistence of activity in the retina. There seems, however, no real reason why the ambiguous and misleading "eidetic image" phraseology should be maintained. It is suggested that the term eidetic imagery be dropped from our already overburdened psychological terminology.

1. The incidence of varying grades of after-image ability on a scale of five steps was found to be: A (highest ability), 9·3 per cent.; B, 9·8 per cent.; C, 19·1 per cent.; D, 31·7 per cent.; E, 30·1 per cent.

2. Of 256 child subjects 69·6 per cent. saw an after-image of a picture. The after-sensations were reported as: Grays only, 8·6 per cent.; all or in part complementary colors, 13·3 per cent.; positive images only, 48 per cent.

3. Of 22 subjects who reported gray after-images 18 were weak in color discrimination, as shown by the Ishihara Test of Color Blindness.

4. There appears to be a definite, positive relationship between age and ability to experience after-images.

5. Boys did not appear significantly different from girls in their after-image abilities.

6. From the present data after-image ability and intelligence appear to be associated, though the correlation is not high.

7. Studies of the relationship between after-imagery and performance in spelling, English composition and art revealed a statistically reliable relationship in the case of art achievement, an insignificant but strong trend for association in the case of spelling, while there was no more than chance relationship with English composition. (Authors' abstr.)

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Psychometric Trends in Senility and Psychoses of the Senium.

The test records (Wechsler-Bellevue) of 100 aged (60 years and over) individuals, some psychotic and some not, were analysed in considerable detail. On the basis of the data obtained and analytic procedure followed, the following conclusions seem to be justified:

No significant differences in psychometric patterns between the several senile diagnostic groups of the patient population were obtained. This fact may be partly due to the inevitable overlapping in the diagnoses.

The total, quantitative scores are lowest in senile psychosis and arteriosclerosis and highest in the remaining two groups of miscellaneous psychoses and non-psychotic.

The discrepancies between the verbal and performance scales, frequently considered as an indicator of inefficiency, tend to be largest in senile psychosis and become lower in the following descending order—arteriosclerosis, miscellaneous and non-psychotic.

Highest scores and ordinal positions are obtained on verbal and untimed power tests, while lowest scores are obtained on timed performance tasks.

It is suggested that the general preservation of information and comprehension is due to the fact that they are tasks based on material learned at an early age. This is consistent with the clinical observations in old age. The consistent decline in the "substitution" test (digit symbol) is also consistent with clinical observations, and suggests the increased perseveration and inflexibility of older individuals.

The factor of age, probably more so than differential diagnosis, is important in the significant decline and negative correlation of the "timed" test items. This is similar to the conclusion in respect to memory stated in an earlier investigation.

With the exception of a generalized decline in absolute score values and the relative positional constancy of such subtests as information comprehension and similarities (high) on one hand and digit symbol and picture arrangement (low) on the other, increasing age levels show no significant changes in "patterning."

The author's findings fail to agree with Wechsler's dichotomy of tests which "do and do not hold up with age."

The similarity between the patterns in old age and schizophrenia is only partial and not better than chance. The statement that schizophrenia resembles "premature ageing" cannot be subscribed to in the light of the present findings. (Author's abstr.)

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The Bruns Syndrome.

The Bruns syndrome is characterized by three features: (*a*) Vertigo, vomiting, headache, and visual disturbance on change of posture of the head; (*b*) a freedom from symptoms between the episodes; (*c*) posturing of the head.

The condition has been most often described in association with cysticercus of the fourth ventricle. It is also found with tumours of the midline in the cerebellum and with third ventricle and lateral ventricle tumours. The origin of the symptoms has been attributed to blockage of the ventricular system on change of posture of the head and to obstruction of flow of the cerebrospinal fluid. A pathological study of five cases suggests the possibility that the disturbance in the vestibular mechanism in the brain stem may be responsible for the symptoms.

S. M. COLEMAN.

Ataxia Associated with Cerebral Signs.

Report on 5 patients showing marked cerebellar ataxia, intention tremor, dysarthria, involvement of the pyramidal tracts, with convulsions in 2 and dementia in 3 cases. None of the patients had a familial or hereditary history. Etiologically 2 were thought to be due to chronic alcoholism, 1 possibly to multiple sclerosis. S. M. COLEMAN.

Effects of Barbiturates and Bromides.

Review of the medical literature of the last five years dealing with the neuropsychiatric effects of bromides and barbiturates. Two case reports are included to demonstrate the psychiatric syndrome of bromide delirium and barbiturate intoxication. S. M. COLEMAN.

Psychiatric Aspects of Epilepsy.

It is found that in institutionalized epileptics the manifestations observed are predominantly psychogenic in origin. The writers conclude that defective personality integration takes precedence over purely anatomical and circumscribed physiological factors in influencing the development of chronic epileptic psychoses and deterioration. S. M. COLEMAN.

SEPTEMBER.

Studies on the Virus Nature of an Infectious Agent Obtained from Four Strains of "Neurotropic" Alpha Streptococci. *Rosenow, E. C.* 229
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Compensation of Nervous Function.

As a neurological term, compensation always means a new function replacing another one, definitely lost. It should not be confused with restitution or substitution. The principle of compensation is derived from the principle of the organism without appealing to any vital power isolated from the organism; it is interpreted solely on the ground of the mutual relationship and interdependence of the parts. Compensation serves the purpose of satisfying the (organogenetic) needs of the remaining parts. It should also be distinguished from intentional effort and training. S. M. COLEMAN.

Sleep Paralysis.

Two cases illustrating the typical features of sleep paralysis with other disturbances of a narcoleptic nature are presented. In both hypnagogic illusions were prominent, and in one precipitation of attacks by terrifying dreams occurred frequently. It is concluded that sleep paralysis is a non-diagnostic symptom which may occur in narcolepsy or independently in otherwise healthy individuals, and that it may be due to a variety of causative factors.

S. M. COLEMAN.

OCTOBER.

*Unusual Reactions to Electroshock. *Osgood, Carroll, W.* 343
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A Test for the Differential Diagnosis Between Retirement Neurosis and Accident Neurosis. *Bergler, E., and Knopf, O.* 366
*Graphology and Medicine. *Eliasberg, W.* 381

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Unusual Reactions to Electroshock.

A review of 357 patients treated by electroshock showed a number of unfavourable reactions. In the treatment room were disproportionate number of *petit mals* (28), panic reactions and perseverative speech. Later reactions were increased restlessness and agitation without much clouding, dazed retardation and states of excitement and unco-operativeness.

S. M. COLEMAN.

Eidetic Imagery in a Psychosis.

Report on a psychotic woman, aged 31, whose delusional system was based on eidetic imagery. The history showed her to be a lifelong eidetic, interviews and tests confirming this. There was no evidence of visual hallucinations, though, depending on the definition of the term, pseudo-hallucinations may have been present. The literature on eidetic imagery is reviewed.

S. M. COLEMAN.

Graphology and Medicine.

In America there are two developments of graphology, character graphology and the technical knowledge of handwriting. The author thinks it is unfortunate that these two should be kept apart. Medicine may use graphology for the diagnosis and prognosis of such diseases as cancer, tuberculosis, rheumatism and pathological ageing. There is great scope for further research in developmental graphology and pathographology.

S. M. COLEMAN.

J. NEUROL. NEUROSURG. PSYCHIAT., LONDON.

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*The Scope and Limitations of Visual and Automatic Analysis of the EEG. *Dawson, G. D., and Grey Walter, W.* 119

Electroencephalography in Cases of Sub-cortical Tumour.

1. Special automatic analysis and accurate location procedure have been used in the electro-encephalography of cases with cerebral tumours affecting sub-cortical structures.

2. In 31 cases subsequent operation or post-mortem revealed the site and extent of the tumour.

3. In cases with superficial tumours spreading inwards, the site of the tumour exhibited 1–3 c/s. (delta) waves; the adjacent areas and parieto-temporal regions showed activity at about 6 c/s.

4. In cases with deep tumours spreading outward the main feature was 6 c/s. activity from the cortex above the tumour and/or from the parieto-temporal regions. A small delta rhythm was sometimes seen immediately above the tumour or as a general effect of raised pressure.

5. In cases with deep tumours not affecting the cortex, the 6 c/s. rhythm was the only significant abnormality. This was usually from the parieto-temporal region, and often could only be distinguished from the normal alpha rhythm by analysis.

6. In cases with more widespread new growth, the 6 c/s. rhythm was seen whenever the basal structures were affected.

7. The occurrence of rhythms at about 6 c/s. from the parieto-temporal region in these cases is related to the similar rhythms found in other clinical and physiological conditions where the basal structures are involved, and also to the effect of experimental lesions of the basal ganglia in monkeys.

8. It is suggested that rhythms at about 6 c/s. should be termed "theta" rhythms, and that such rhythms are characteristic of the resting, immature or isolated parieto-temporal cortex.

(Authors' abstr.)

The Wernicke Syndrome.

A pathological investigation has been made in seven cases presenting the Wernicke syndrome. In two cases there was a history of alcoholism and in three of pernicious anaemia; in one the condition followed hyperemesis gravidarum and in one it followed gastric carcinoma.

The last case has been decribed in full, as it was distinguished by an atypical clinical course in which mania was present for a considerable time. It is important that the oldest and severest lesions were localized in the anterior portion of the hypothalamus. The incidence of manic syndromes associated with hypothalamic lesions has been discussed in the light of previous experimental and pathological observations.

The same case of gastric carcinoma had a peculiar cerebellar lesion affecting predominantly the granular layer.

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In four of the five cases which were fully investigated inferior olives were damaged in a characteristic way, the neurones of the medio-dorsal corner undergoing homogenizing degeneration. The possibility of a deficiency factor in the pathogenesis of the olivary lesions has been discussed. (Author's abstr.)

The Electroencephalographic Localization of Intracranial Neoplasms.

Results obtained by EEG in 120 intracranial tumours and 5 abscesses are tabulated and discussed. About 50 per cent. of accessible lesions were correctly localized. It is not considered that cerebellar tumours are normally localizable.

There is a somewhat greater tendency to slowing of the alpha rhythm than in other cases, including acute head injuries. Asymmetry of alpha rhythm is an inconstant but sometimes useful finding.

The record associated with raised intracranial pressure is exceedingly variable, and bears no direct relationship to the height of the pressure nor to the degree of papilloedema, but some to the state of consciousness.

The " ideal " method of localization is the finding of phase-reversal of slow waves, but not infrequently one must depend upon their maximum intensity. Where a number of slow rhythms are present the slowest is usually of major significance for localization.

From the accessible tumours nine normal records were obtained, of which seven were from parasagittal lesions, emphasizing the well-known difficulty in their localization.

Hyperventilation is unlikely to do more than accentuate the features of the resting record.

It is suggested that the 4–7/sec. frequency band or theta rhythm has a special significance, and is associated with lesions in the region of the third ventricle. A number of cases are described in which this concept has proved of localizing value. (Author's abstr.)

The Electroencephalogram in Traumatic Epilepsy.

Electroencephalograms have been recorded in large groups of patients with idiopathic epilepsy, traumatic epilepsy and with head injuries without epilepsy, as well as in a large control group of normal subjects. EEGs were also obtained before and after the onset of traumatic epilepsy in a small group of subjects.

The records in these groups have been compared, and the results obtained show that larval epileptic outbursts in the EEG are invariably associated with overt fits, while less well-defined paroxysmal outbursts are also frequently associated with fits. These disturbances, which occur in 25 per cent. of traumatic epileptics compared with 56 per cent. of idiopathic epileptics, may be used with other signs to predict the likelihood of traumatic epilepsy. In other cases of head injury when these changes are absent, the EEG offers no such help. The likelihood of epilepsy supervening when these disturbances are present has been examined in closed and penetrating head injuries.

The records made before and after the onset of fits show that the characteristic episodic changes often appear in the EEG before the onset of traumatic epilepsy.

The site and nature of the disturbances in traumatic epilepsy are described. A distinction is made between the immediate and direct effects of trauma upon the EEG and the remote, indirect and persistent effects which are usually associated with epilepsy. The results are compared with those of other workers, and are used in discussing the relationship of symptomatic to idiopathic epilepsy. (Author's abstr.)

The Relation Between the Effects of the Blood-Sugar Levels and Hyperventilation on the Electroencephalogram.

1. The response of the EEG to hyperventilation at raised blood-sugar levels has been studied in 71 adult patients who showed instability of cortical rhythms when fasting. The subjects include patients with epilepsy (22), neurosis (17), psychopathic personality (17), and post-traumatic states (9).

2. Two types of reaction have been observed ; one (group 1) in which raising the blood-sugar level inhibits the appearance of slow rhythms, and another (group 2) in which, although there is a reduction in amount, slow rhythms are still elicited with a blood-sugar value of 130 mgm. per cent. or above.

3. There is a significant relation between the degree of abnormality of the resting EEG and the group into which a case falls. Those cases with a normal or mildly abnormal resting EEG tend to fall into group 1, and those with a more than mildly abnormal resting EEG into group 2.

4. All the neurotics are found in group 1 and all the epileptics in group 2.

5. Instability of the EEG on hyperventilation at blood-sugar values above 130 mg. per cent. is significant, and its presence in these circumstances markedly increases the probability that the patient is an epileptic. (Author's abstr.)

The Scope and Limitations of Visual and Automatic Analysis of the Electroencephalogram.

1. The complex nature of the waves recorded in the EEG is considered.

2. The use of a synthetic method for demonstrating the formation of complex waves, such as occur in the EEG, is described.

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3. Mixed rhythms of types common in the EEG are synthesized, and the effects on the form of such rhythms of variations in the size and frequency of their components is demonstrated.

4. Certain types of waves which have entirely different compositions are shown to be indistinguishable to the eye.

5. The specific forms that are produced when certain common harmonically related components are added together are shown.

6. The effects on the above forms of the phase relations of the components are demonstrated.

7. The use of the specific forms as a basis for deducing the presence in the EEG of rhythms not obvious to the eye is indicated.

8. Simplification of the EEG by the use of close bipolar leads is suggested.

9. It is suggested that many of the complex EEG wave forms are due to the simultaneous generation of a number of harmonically related sinusoidal waves.

10. The application of the principles described to EEG examination both with and without automatic analysis is discussed, and the limitations and possibilities of visual and automatic analysis of the EEG are considered. (Authors' abstr.)

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A Note on the Two Components of the Dorsal Root Potential.

The potential in one dorsal root produced by the stimulation of another and distant dorsal root naturally divides itself into two parts. The first part has the characteristics of being not appreciably affected by strychnine, but readily abolished by sectioning the dorsal columns of the cord between the stimulating and leading roots. The second has the opposite characteristic, viz. it is greatly enlarged and prolonged by strychnine, but quite undiminished by the sectioning of the dorsal columns. To explain this difference, the most obvious supposition to make seems to be that the first part of the potential results from impulses reaching the region of the third root terminations directly from the ascending collaterals of the ninth root in the dorsal columns, while the second is produced by impulses pursuing a more devious course among the internuncial neurone chains between the two roots. For, assuming as is usual that the action of strychnine lowers synaptic resistances, a striking effect of this drug is only to be expected where there are many synapses to be traversed. And given a sufficient lowering of synaptic resistances, it is not surprising that the stimulation of the ninth root can exert its undiminished influence on the third root even after their direct fibre connections in the dorsal columns are severed. The second part of the dorsal root potential recorded evidently has its origin in the activity of the internuncial neurones. Whether the first also involves internuncial neurones or not cannot

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be so definitely stated. But it is in accordance with the economy of hypothesis to suppose that even the first part is due to certain internuncial neurones in the immediate neighbourhood of the third root terminations activated directly via the ascending collaterals of the ninth root.
(Authors' abstr.)

Receiving Areas of the Tactile, Auditory and Visual Systems in the Cerebellum.

1. By determining the occurrence and distribution of evoked electrical responses it has been shown that there are, in the cerebellar cortex of the cat, distinct areas which receive nerve impulses from tactile, auditory and visual receptors.

2. The receiving areas for impulses of tactile origin are located in three parts of the cerebellum. In each lateral half of the anterior lobe and in adjacent folia there is a projection of the ipsilateral half of the body surface in which the feet and the vibrissae are the parts most conspicuously represented. The forefoot and hindfoot of one side are represented in both paramedian lobules, the forefoot having a stronger contralateral representation than the hindfoot. In the rostral area (anterior lobe and adjacent folia) the tactile representation shows an anatomical localization in the sense that different zones are related to different parts of the body surface.

3. The auditory area is largely restricted to the lobulus simplex and the tuber vermis. In most cats it extends somewhat into the posterior folia of the culmen, the anterior folia of the pyramis, the medial portions of crus I on each side and both paramedian lobules. The responses evoked by auditory stimuli are not affected by decerebration at an intercollicular level. They are abolished by section of the eighth nerves or destruction of the cochleae or removal of the inferior colliculi. They are not altered by section of the fifth nerves.

4. The visual area overlaps the auditory and in most cats the two areas are conterminous. The cerebellar responses to photic stimuli are not modified by bilateral section of the fifth and seventh cranial nerves or by removal of eyelids and extra-ocular muscles on both sides. They are unaffected by removal of all cerebral neocortex, and depend on a pathway which probably involves the superior colliculi.

5. Full anesthetic doses of sodium pentobarbital appear to have little effect on the tactile responses, but they markedly depress the auditory and completely abolish the visual. The auditory and visual areas are most clearly revealed when chloralosan is used as the anesthetic.

6. It is suggested that cerebellar functions are influenced by tactile, auditory and visual stimuli as well as by impulses from proprioceptors and from the cerebral cortex.
(Authors' abstr.)

Spreading Depression of Activity in the Cerebral Cortex.

In rabbits under dial narcosis, weak faradic or mechanical stimulation of the exposed cerebral cortex elicits a characteristic response designated "spreading depression."

Shortly after the stimulation the spontaneous electrical activity decreases markedly at the stimulated region. The depression then slowly spreads in all directions, successively affecting adjacent areas. Within 3 to 6 minutes it involves all of the dorsolateral cortex, except the area retrosplenialis granularis dorsalis (Rsg β_1 of Rose). The depression can be initiated in any of the regions involved in the spread, but is usually more readily obtained from the frontal than from the occipital areas.

Recovery of the initial pattern of spontaneous activity is slow; it requires, as a rule, 5 to 10 minutes at each region. The spontaneous activity at the stimulated region is often well recovered at a time when the depression is just starting in distant parts. If only weak stimuli are used, depression at any region runs the same course regardless of what region is stimulated.

Only with supraminimal stimulation does the depression spread to the opposite hemisphere, then appearing first in the region symmetrical to the point of stimulation and thence spreading as in the stimulated hemisphere.

The spreading depression affects not only the spontaneous electrical activity, but also several cortical responses, i.e. responses to touch, to electrical stimulation of afferent nerves, to illumination of the retina, to ipsilateral or contralateral cortical electrical stimulation, and to local application of strychnine or of eserine plus acetylcholine. Single shocks applied to a depressed region fail to elicit typical responses in the opposite non-depressed hemisphere.

Specific activity, different from the spontaneous, often develops during the period of depression of a region. The most common type of this activity is composed of large, slow, localized potential waves, during which one electrode becomes negative with respect to others 1 to 3 mm. distant. Fast components may also appear, and the activity when intense closely resembles the "seizure pattern" of experimental epilepsy.

The depression and "tonic-clonic" activity of experimental cortical epilepsy seem to be closely related phenomena. The spread of tonic-clonic responses is probably mediated by the same cortical elements which are involved in the spread of depression. The two processes are mainly or exclusively cortical, i.e. they do not require a contribution from sub-cortical centers. Their development and characteristics are not determined by the stimuli, but depend on the local characteristics and conditions of the affected regions. (Author's abstr.)

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Influence of Conditioning Nerve Stimuli on Relayed Volleys Evoked from Spinal Cord. Periodic Facilitation and Inhibition.

Local stimulation with needle electrodes placed laterally in the spinal cord elicits a number of oscillations of synchronized impulses which have been picked up in the peroneal nerve. The different synchronized waves of this complex response can be inhibited or facilitated by a conditioning stimulus to the ipsilateral popliteal nerve in a manner dependent upon the time interval between the conditioning stimulus and the test stimulus to the spinal cord.

It is shown that the conditioning stimulus causes a rapid periodic variation of inhibition and facilitation in which four inhibitory minima and four excitatory maxima can be noted. The number of such depressions and facilitations may vary from experiment to experiment, but their temporal location with respect to conditioning stimulus is constant within relatively narrow limits. (Author's abstr.)

Sustained Facilitation and Post-Inhibitory Rebound of Relayed Volleys in the Spinal Cord.

In earlier experiments on reflex muscular contractions rebound contractions have been noted after both ipsilateral and contralateral flexor reflexes and possible explanations have been suggested, in particular by Sherrington. The experiments described in this paper add a new factor by pointing to the significance of proper timing of the interacting stimuli, and correlating the phenomenon with the inhibitory phase of the periodic variations following a stimulus to the center. At the same time they confirm Sherrington's original view that rebound is a consequence of preceding inhibition.

In the earlier reflex work rebound was sometimes noted without preceding inhibitory relaxation and assumed by Graham Brown to be "concealed." Similarly, in this work, it has been noted that rebound occurs after stimulation with a combination *representing an inhibitory interval*, even when the actual inhibition has been slight or absent. It is clear that an average reaction such as a reflex muscle contraction must then be able to exhibit rebound without evident signs of a preceding inhibition. Nevertheless the necessity of using an inhibitory interval between conditioning and test stimulus in order to elicit this phenomenon demonstrates the essential place of pre-excitatory inhibition in the rebound reaction.

It may be of interest to point out that the retinal off-effect in a like manner pre-supposes pre-excitatory inhibition, and that recently Bremer has shown that there is a similar off-effect or rebound in the acoustic area of the cat.

The sustained facilitation, studied by Eccles and Granit in both contralateral and ipsilateral reflexes, also is a quite regular phenomenon, referable to the stimulation intervals at which periodic facilitation occurs and can be analyzed in the manner described. (Author's abstr.)

Midbrain Auditory Mechanisms in Cats.

1. The contribution of discharge through the inferior collicular commissure is negligible in the total activity of the inferior colliculus.
2. As measured electrically, the contribution of the contralateral ear to collicular response is slightly greater than that of the homolateral ear.
3. The explanation of functional bilateral equality in auditory conduction from either ear probably lies in bilateral terminations of secondary auditory fibers in the superior olivary nucleus, which contributes substantially to the lateral lemniscus.
4. Functionally significant numbers of fibers of lateral lemniscus bypass without synapsing in the inferior colliculus.
5. The inferior colliculus discharges through the superior colliculus.
6. The inferior colliculus is an important reflex center capable of auditory integration. (Author's abstr.)

Paralysis with Hypotonicity and Hyperreflexia Subsequent to Section of Basis Pedunculi in Monkeys.

Interruption of the basis pedunculi in the monkey gives rise to a paralysis which is intermediate between spastic paralysis and hypotonic paresis. This paralysis is characterized by hypotonicity of all muscle groups, excepting the extensors of the digits, by hyperactive deep reflexes and by the absence of clonus.

This leads to the assumption that inhibitory pathways descending from the cerebral cortex do not course entirely within the basis pedunculi. Fibers whose interruption is responsible for the phenomenon of hypertonicity and those dealing with clonus, for the most part, have deviated from the corticospinal projection prior to reaching the cerebral peduncle. Those whose interruption leads to hyperreflexia accompany the cortico-spinal projection while passing through the cerebral peduncle but deviate before reaching the pyramids. (Authors' abstr.)

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Degree and Nature of Regeneration of Splanchnic Innervation to the Adrenal Gland Two Years Following Complete Bilateral Sympathectomy in Dogs.

The thoracolumbar sympathetic chain, rami communicantes and splanchnic nerves were removed on both sides in two dogs, a male and female, to determine effects on behavior of dogs under experimental conditions. No changes in behavior were observed.

After a lapse of two years an autopsy was performed to determine the nature and degree of nerve regeneration. Pseudoregeneration of the sympathetic trunk was found on one side in the male and on both sides in the female.

Histological examination of the false nerve trunks showed that they were composed mainly of perineural strands surrounded by connective tissue, the strands containing a few, often scattered, regenerated nerve fibers coming from the 3 or 4 lower thoracic and first lumber rami communicantes. In two instances there appeared to be a regeneration of the typical splanchnic nerves, but these apparent nerves were found to consist of perineural trunks containing a remarkable scarcity of regenerated nerve fibers coming from stumps of the severed rami communicantes.

The regenerated nerve fibers were of small number, often distorted and scattered in the course of the false nerve trunks. More distally they appeared to be lost in the connective tissue as they approached the adrenal gland.

The stumps of severed nerves near the gland contained only a few, if any, nerve fibers.

The number of regenerated fibers which entered the medullae of the glands was very few. The exact number could not be determined. We have estimated them to be not in excess of 5 per cent. in some of the specimens, although the number of regenerated fibers in the false nerve trunks was greater.

There appear to be post-ganglionic vasomotor nerves of a moderate amount coming from the coeliac and periadrenal ganglia which were not affected by the sympathectomies.

A third dog was prepared for study of acute stages of nerve degeneration. Autopsy was performed 14 days after a lower left thoracolumbar and splanchnic sympathectomy and 6 days after a similar operation on the right side. The left side showed complete denervation of the sympathetic chain, splanchnic nerves and adrenal medulla; and the right showed an acute stage of degeneration and fragmentation of nerve fibers in these parts.

The nerves and glands of a fourth normal, unoperated dog were used as technical controls for histological studies.

It seems fair to conclude that regeneration of splanchnic and sympathetic nerves after a total sympathectomy is relatively small, and far smaller within the gland than suggested by the size of the regenerated false nerve trunks when no histological examination is made. Moreover, it is clear that some of the preganglionic neurons in the intermediolateral cell column of the spinal cord survive the operation, and are capable of regenerating axons which tend to course along the older channels that are partially restored by the precocious regeneration of perineural sheaths. A small number of fibers may reach the medulla of the gland in some instances. The evidence presented from two animals is small, and further investigation may show that more regeneration than we have found may occur in the glands in other cases.

(Authors' abstr.)

Restoration of Vision after Crossing of Optic Nerves and after Contralateral Transplantation of Eye.

1. Intrinsically well-organized visuomotor co-ordinations were recovered in 21 anurans after crossing of the optic nerves and in 2 anurans and 12 urodeles after contralateral transplantation of the eye.

2. These recovered visuomotor responses, however, were schematically correlated with the anatomical rearrangements and thus were extremely maladaptive. Hence their intrinsic organization could not be ascribed to learning, and must instead have been a product of the regeneration process itself.

3. The experiments extend the evidence that the re-establishment of functional relations between retina and visual centers is strictly and systematically pre-determined by growth regulating factors irrespective of functional adaptation. (Author's abstr.)

Observations of Gas Bubbles in Pial Vessels of Cats following Rapid Decompression from High Pressure Atmospheres.

Gas bubbles were observed directly in pial blood vessels following rapid decompression of anesthetized cats from air compressed to 75 pounds per square inch (gage pressure). When gas bubbles were visible in pial vessels they always appeared first in the arteries, later in the veins. Gas bubbles were also present in other blood vessels of the body as well as in the right

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auricle and ventricle. Some animals died, although no bubbles appeared in the pial vessels of the microscopic field under observation. Since, in all animals, the distribution of gas bubbles elsewhere in the body was the same, it may be assumed that, in those instances in which bubbles were not seen, bubbles were present in arteries supplying a portion of the central nervous system other than the field under observation. (Author's abstr.)

Propagation of Spreading Cortical Depression.

1. Hitherto unexplored areas of the rabbit cortex were found to exhibit spreading depression, leaving the areas Rsg of Rose as the only major region not participating.

2. Elicitation of the phenomenon in one hemisphere by stimulation of the opposite one was found to depend upon an intact corpus callosum. Such interhemispheric conduction was found to differ importantly from spread of the phenomenon within either half of the cortex.

3. The spreading of the phenomenon was found to be independent of subcortical connections, and indeed of at least the three lower layers of the grey matter. Acute anemia of the cortex, for periods up to a minute in duration, did not interfere in any way with the spread of cortical depression or vasodilatation in progress at the time of onset of the anoxic period.

4. Short weak tetanic stimulation, applied near the surface of the cortex but not to deeper layers, direct current for various periods of application, or isotonic potassium or calcium chloride were most effective in eliciting the process. Physostigmine, acetylcholine, strychnine, cocaine, histamine and adrenalin were found to be ineffective.

5. Cocaine applied to small areas of the cortex was found to restrict the spread of depression and vasodilatation even though it was not placed directly in its path.

6. These observations were discussed and shown to cast doubt upon the hypothesis that the phenomenon depends upon a neuron-to-neuron transmission of " inhibitory impulses." Various other possibilities were discussed. (Authors' abstr.)

Influence of Depletion of Diffusible Electrolytes upon Electrical Activity of the Brain.

1. Frogs can be depleted of 30–40 per cent. of their body chlorides by being immersed in distilled water for periods of several days or weeks.

2. This depletion of NaCl associated with the loss of other diffusible substances as, for example, potassium and calcium salts as well as glucose reduces the electrical brain activity, which is characterized in part by the appearance of Delta-like waves and further in a marked reduction in wave frequency and amplitude. Both of these alteration types can appear at intervals alternately.

3. The degree of reduction of electrical activity can vary in different brain areas and the depressed activity can be restored by intralymphatic injection of small amounts of NaCl. When the electrical activity has been too severely impaired by the excessive loss of diffusible substances, it is not possible to restore the activity by means of administering either NaCl, KCl, or vitamin B.

4. The successful treatment of shock with saline may be in part explained on the basis of the central action of saline in improving the electrical activity, and thereby aiding the restoration of the impaired vital centers.

5. The depression of the electrical brain activity is explained as due to the inhibitory effect upon the oxidative processes of the brain resulting from the loss of NaCl and glucose.

(Authors' abstr.)

Functional Organization of the Giant Fiber System of Lumbricus.

1. The giant fiber system of the earthworm is a favorable object for the study of functional organization by means of action potential recording, since its potential spikes are large and simple, few in number, detectable from the surface of the intact animal or from the exposed, intact nerve cord, readily and dependably excitable by electrical stimulation of the surface of the intact animal and by normal mechanical means.

2. A consistent and characteristic pattern of two spikes is elicited by direct electrical stimulation of the cord. The two spikes are of different threshold, conduction rate, height and form, the faster one typically having the lower threshold and the lower amplitude. Each occurs in an all-or-none fashion and stimulus strength has no effect above threshold. They behave as single fiber action currents, and are shown to represent the activity of the giant fibers, the smaller, faster spike belonging to the larger, median fiber.

3. The overall, effective speed of conduction (not counting any utilization time or synaptic delays at the segmental septa) is very high—up to 45 meters or more per second (24° C.)—probably the fastest conducting fibers yet recorded among invertebrates, although they are far from the largest. The time for conduction from head to tail increases as the worm is stretched, but not proportionately, so that the rate also increases. This is a normal, reversible phenomenon.

4. The pattern of two spikes is the same, when elicited by direct electrical stimulation of the fibers, regardless of the site of stimulation, site of recording electrodes or direction of conduction. Evidence is presented that this is because the giant fibers are unpolarized.

5. The pattern of response of the giant fibers to normal mechanical stimulation, as it probably occurs in nature, is described. They are apparently on the efferent side of the reflex arc, but are not probably the final common path. A normal response may consist of a single spike or a dozen or two at a frequency of 50–200 per second. Only a single spike from, i.e., a single fiber is activated by any one stimulus. The median fiber fires as a result of stimulation

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anterior to about the fortieth segment; the laterals fire to stimuli posterior to this point. But in either case the spikes are conducted in both directions, to all parts of the worm. The apparent polarization of the system noted by earlier workers is due to regional localization of sensory connections capable of firing the giant fibers.

6. Nicotine in concentrations as high as 1 : 10,000 did not abolish conduction over the giant fibers within 30 minutes.

7. From the physiological evidence certain predictions of histological findings are made. The typical anastomoses described by Stough are confirmed and those of Haller and others are denied on this basis.

8. The high speed of conduction and its unpolarized character are significant in view of the apparently synaptic nature of the system as demonstrated histologically. These properties are compatible with and perhaps constitute a demonstration of recent theories which suppose that the synapse is not inherently polarized nor delaying, but is only so as a result of the particular anatomical relations prevalent in vertebrates, and that these properties should not be a part of the definition of the synapse. This interpretation is in harmony also with recent opinions to the effect that the nerve net of lower invertebrates exhibits unpolarized synapses.

(Author's abstr.)

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Post-Traumatic Headache.

1. Two hundred consecutive hospitalized cases of head injury between the ages of 15 and 55 years, exclusive of chronic alcoholism and vagrants, were followed from the time of injury for a period of six or more months. The investigating team consisted of neurologists, psychiatrists, psychometrist, electroencephalographer and social worker.

2. One hundred and thirty-eight patients (69 per cent.) complained of post-traumatic headaches, 63 patients (32 per cent.) of headaches lasting longer than two months, and 59 patients (30 per cent.) of headaches that did not persist beyond the hospital stay. In 11 patients (6 per cent.) the headaches began after discharge from the hospital.

3. Post-traumatic headaches are regularly intermittent. They may be precipitated by postural changes, effort, fatigue, or emotional upsets, or they may appear without relation to any such factors. They are characteristically variable from patient to patient with respect to severity, character of pain, and localization. This variability is characteristic of all groups of post-traumatic headache.

4. Headaches lasting for longer than two months are characteristically associated with dizziness and nervous symptoms (fears, anxiety, fatigue, irritability and/or inability to concentrate). This association is a statistical reflection of the composition of the well-known post-traumatic syndrome.

5. The incidence of such prolonged headaches was high among patients with nervous or neurotic symptoms prior to injury, with complicating environmental factors (including compensation), with symptoms of marked immediate emotional reaction to the injury, and with scalp lacerations; it was low among recreational accidents, and among patients with very mild head injuries (no measurable duration of coma, disorientation, or permanent post-traumatic amnesia).

6. These relationships suggest the importance of both psychological and physical factors in the production of prolonged post-traumatic headache in the majority of cases. Even in headache localized to the region of known damage to scalp or skull psychological factors had high correlation.

7. A striking liability of headaches localized to the site of previous scalp injury to provocation by posture or physical effort provides evidence that such provocation in more diffuse types of headache indicates underlying structural damage. A liability of provocation by histamine, particularly when the headache had been unilateral, suggests that intracranial localized vascular or perivascular change may occur.

8. Neither changes in the spinal fluid, in the electroencephalogram, in the reflexes, in the degree or extent of scalp or cranial injury nor in the extent of disorder of consciousness immediately after the injury give adequate prognosis of subsequent liability to headache. Headache was, however, significantly less common in those who had no initial disorder of consciousness. Five of the seven cases with no initial disorder of consciousness but persistent headache thereafter had localized scalp injury. (Authors' abstr.)

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Physiological Differentiation of Emotional States.

The author believes that there are at least three different physiological states corresponding to three different emotions: *Fear*, with predominantly sympathetic excitation; *anger*, with strong parasympathetic excitation; and *excitement* or elation, with moderate parasympathetic activity. It would depend on the autonomic reactivity of the individual and the intensity of his emotional experience whether the reaction to the emotional effects will be noticeable during emotional stimulation or after it.

The author also distinguishes two excitatory states which they hesitate to call emotions (startle and explosive or epileptoid reactions), for both seem to represent a short circuit—what has been called a "functional decortication"—via the cholinergic mechanism of the parasympathetic and central nervous systems. In both cases a "conscious" evaluation of the stimulus situation seems to be missing.

The author suggests further that the most favorable conditions for activity are found in a moderate stimulation of the cholinergic mechanism, resulting in facilitation of action by "excitement" without untoward secondary adrenalin effects (at least for the duration of the activity). Neither anger nor fear can be shown to have an emergency function. Rather they represent obstacles to efficient action, the former by short-circuiting too large an amount of excitation into the parasympathetic system, the latter by inundating the sympathetic system.

Amending Cannon's theory of homeostasis the authors would suggest, therefore, that during overactivity of the sympathetic division of the autonomic nervous system (in fear or cold) the balance of the organism is restored by a cholinergic *reaction* in the form of activity; and during parasympathetic overactivity (in anger or during heat) by a secondary sympathetic *reaction* with its adrenergic effects. If such a reaction is delayed or insufficient, or if the original stimulus is protracted too long, the primary effects of overstimulation may become irreversible.

(Author's abstr.)

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The Carbohydrate Tolerance of Mentally Disturbed Soldiers.

The Exton-Rose glucose tolerance test was performed on 20 normal soldiers and 91 military patients discharged because of psychiatric disorders. The patients showed a higher incidence of abnormal sugar tolerances (70 per cent.) than the normal subjects (30 per cent.). Excessive secretion of adrenalin did not seem to be a major factor in the causation of such trends. A relationship between high blood-sugar level and psychological condition is suggested by certain Rorschach findings and by the alteration of the blood-sugar level of subjects with normal trends by the introduction of a state of psychological stress. (Authors' abstr.)

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Brain Waves and Clinical Features in Arteriosclerotic and Senile Mental Patients.

1. Fifty-three arteriosclerotic and senile patients were studied from both the EEG and the clinical points of view. The EEGs were classified according to previously defined criteria. The following clinical symptoms proved to be particularly important in relation to this study: confusion, irritability, agitation, anxiety, delusions, depression and hallucinations. Memory disorders had to be disregarded, being obscured by confusion. However, they have been taken into consideration in making the diagnosis of these patients.

2. About a third of these patients show a markedly abnormal pattern (slow), whereas another third do not present any definite abnormality.

3. In the group of patients with marked slow abnormality, the clinical complex confusion —irritability overshadows the complex anxiety—agitation—delusions. The opposite finding is observed in the group of patients with normal or only borderline tracings.

4. The doctrinal significance of the existence of definite organic lesions which do not produce a marked EEG abnormality when associated with anxiety, agitation and delusion is stressed. The relationship of this group of patients with those suffering from involutional psychosis is suggested. (Authors' abstr.)

Brain Waves and Heredity in Mental Diseases.

Electroencephalographic examinations were performed on 118 patients aged between 13 and 23 years, suffering from all types of mental disease. Thirteen of these patients had a personal history of a neurological disorder. These patients were classified in different groups according to the presence and importance of the abnormal hereditary factors.

There are relatively more patients with normal EEGs in the population with a negative family history than in the population with mental conditions in the family.

Both the theoretical and practical significance of these findings is stressed.

(Authors' abstr.)

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THE
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No. 385 [NEW SERIES No. 349.] OCTOBER, 1945. VOL. XCI

Part I.—Original Articles.

NEUROPATHOLOGICAL PROBLEMS ARISING FROM PREFRONTAL LEUCOTOMY.*

By A. MEYER, M.D.Bonn, and E. BECK.

From the Neuropathological Department, Central Pathological Laboratory, London County Mental Health Services.

Outline of Problems.

THE neuropathological problems which arise from prefrontal leucotomy may be conveniently divided into three groups.

The first group is concerned with the analysis of the anatomical and possible other factors which may influence the prospect of recovery. This group is naturally of the greatest practical interest to the psychiatrist and, for this reason, will require our foremost attention.

Secondly, the operation constitutes, apart from the therapeutic aspect, a human experiment of first-class importance in neuro-anatomy. Since much of our knowledge of the neuro-anatomy of the regions involved is based upon experiments in animals, a most welcome opportunity has arisen to compare these with the conditions in the human brain. The neuro-anatomical harvest has been considerable; so much so that only a few of the results which have a direct or indirect bearing on the problem of leucotomy can be summarily included in this paper. It is our intention to publish a fuller account later in the *Journal of Anatomy*.

Thirdly, the operation enables us to study biopsies from the brain of mental patients. The customary surgical methods limit the scope of this investigation, as it is usually impossible to obtain a sufficiently large and undamaged piece of cortex, but with certain precautions it is not difficult to produce a cylinder of white matter. We are at present utilizing this material and studying the oligodendroglia, which was found by Elvidge and Reed (1938) to be affected by swelling in patients suffering from functional psychosis. This special investigation, however, is not yet sufficiently advanced to be included in this paper; it will be the subject of a separate publication (in conjunction with McKissock).

Material.

Our material consists of seven histologically investigated cases of prefrontal leucotomy, to which has been added an eighth case in which frontal lobectomy had been carried out in a mentally normal patient suffering from a basal meningioma. This last case has proved of great value as a test case for complete severance of fibre connections. In two further cases (9 and 10) macroscopic investigation only has been carried out so far. We wish to express our gratitude to Prof. Le Gros Clark, Col. McCowan, Drs. Cook, Dax, Harris, McCartan, Rees and Ström-Olsen and to Mr. McKissock for their generous permission to utilize the brains from their cases for the preparation of this paper.

* This paper was read at the Quarterly Meeting of the Royal Medico-Psychological Association on May 31, 1945, in Birmingham.

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It is not proposed to give a full description of the clinical and pathological data, as it is likely that, in due time, the problem will have to be reviewed on a more comprehensive scale, with the addition of a number of new cases now under investigation. For the purposes of this paper it was thought, however, useful to give a survey of the most important data in tabulated form (Table I). This shows that the survival period varied from 3 days to 3 years. Some of the cases had received unsuccessful convulsion or insulin treatment prior to the operation. Death in the early stages resulted from meningitis or haemorrhage. Haemorrhages may be very considerable, as, for example, in Case 1 (Fig. 1), in which the whole white matter of the frontal lobes was converted into a haemorrhagic mass. This patient died after six days, but other cases complicated by haemorrhage have survived, the haemorrhage being slowly converted into cysts or softening. Figs. 2 and 3 show such sequelae of haemorrhages. In these the white matter has an appearance quite different from the slit-like, smooth-walled cyst which Freeman and Watts (1942) described as the normal result of the operation. Other adverse complications include uraemia and a fairly advanced senile atrophy in Case 3; pellagra in the same case (Fig. 4); hypertensive disease and a terminal Wernicke syndrome with the typical mesodermal proliferation in the mammillary bodies and other hypothalamic centres in Case 4 (Fig. 5), indicating vitamin B_1 deficiency; and lastly, post-operative epilepsy in Case 5. So far we have not found any anatomical changes that would account for the epileptic convulsions. It is interesting that in this case the lesion was further away from the motor cortex than in any of the other cases, and the prefrontal cortex was certainly not more damaged than usual. The patient died in *status epilepticus*.

Analysis of the Factors which may determine Recovery.

The rationale of the operation is generally considered to be isolation of the prefrontal cortex by cutting its fibre connections with other parts of the brain. This is not the place to discuss at length the function of the frontal lobe. Much pathological evidence has accumulated in the past, tending to show that bilateral lesions of the frontal lobes and particularly the orbital parts result in syndromes of euphoria (Witzelsucht) and general disinhibition, considered likely to neutralize depression, tension, inhibition, obsessional features, etc., of patients submitted to the operation. According to Rees (1943), whose views are in close agreement with those of Freeman and Watts (1942), the frontal lobe is concerned with imagination, the social sense, self-consciousness and the projection of the self into the future. He goes so far as to associate the Freudian "superego" with the function of the frontal lobe and the "id" with that of the thalamus. This is, of course, an oversimplification, and comes dangerously near to what Cobb (1943) has criticized as "neurologizing psychology." Cobb is much opposed to regarding the frontal lobes as centres for foresight, imagination or, indeed, any specific traits of man. The frontal lobes are important, as they allow "long circuiting" actions, and the operation has its effect by reducing the number of possible circuits for association. According to Cobb this concept explains better than any "centre" theory the fact that the initial symptoms of lesions of the frontal lobes may subside in the course of time in measure as unspecialized paths of association take over the function of the cut fibres.

The majority of fibres cut by the operation belong to the thalamo-frontal tract, which connects the nucleus medialis dorsalis of the thalamus with the prefrontal region. The nucleus medialis dorsalis is connected with other thalamic nuclei and —by way of the medial magnocellular portion—with hypothalamic centres. According to Walker (1938), its role is to serve as an "integrating centre for somatic sensory and visceral impulses, presenting them to the cortex of the pre-frontal region in a complex form . . . as sensory concepts." Freeman and Watts (1944*a*) think that in addition to the thalamo-frontal fibres a bundle running near the midline is of importance. They suspect it to be the fasciculus cinguli, and give a vivid description how, after sectioning this suspected bundle, the patient loses contact with reality and drifts into confusion and unresponsiveness. The fasciculus cinguli runs along the white matter of the gyrus cinguli, and it is interesting that the latter is, again, connected with the anterior nucleus of the thalamus. Evidence is accumulating that the prefrontal cortex, and particularly its orbital region, the

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Case number.	Age at the time of death.	Duration of psychosis prior to operation.	Symptomatology and diagnosis.	Previous treatment.	Prefrontal leucotomy.	Post-operative course.	Interval between operation and death.	Special pathological findings.	Cause of death.
1	43	4–5 years	Agitated depression, with the usual melancholic delusions	Unsuccessful convulsion treatment	Watts' technique	—	6 days	—	Purulent meningitis, cerebral haemorrhage. Moderate cerebral arteriosclerosis as a contributing factor.
2	30	9 years	Schizophrenia (hallucinated, deluded, impulsive and violent)	Ditto	Ditto	—	3 ,,	—	Purulent meningitis.
3	72	About 4 years	Depression (acutely agitated, distressed, self-reproachful, no intellectual impairment)	,,	,,	No improvement	2 months	Slight diffuse loss of nerve cells in all cortical regions with corresponding degree of glial proliferation. Fair number of senile plaques. Retrograde degeneration of large nerve cells of precentral cortex, pons and medulla, suggesting pellagra.	Uraemia due to hypertrophy of the prostate. Pellagra.
4	50	2 years	Paraphrenia (deluded, hostile and impulsive. Suffers from hypertensive disease)	—	,,	Disappearance of hallucinations, but offset by severe frontal lobe deficit syndrome and restlessness	4 ,,	Mamillary body and nucleus paraventricularis contained gliomesodermal proliferation and petechial haemorrhages characteristic of the Wernicke syndrome.	Exhaustion due to restlessness. Thiamine deficiency. Hypertensive disease may have been a contributing factor.
5	44	About 20 years	Schizophrenia (hallucinated, deluded, violent and destructive)	—	,,	No improvement	17 ,,		*Status epilepticus.*
7	30	At least 3 years	Schizophrenia (deluded, excited, abusive and destructive, attempted suicide)	Unsuccessful convulsion treatment	Crombie's technique	Considerable improvement	8 ,,	—	Tuberculous abscess.
8	41	4–5 years	Paraphrenia (hallucinated, deluded, sometimes excited)	—	Ditto	Ditto	16 ,,	—	Carcinoma of oesophagus.
9	39	About 3 years	Schizophrenia (depressed, suicidal, hallucinated, deluded)	—	,,	,,	21 ,,	—	? Pulmonary tuberculosis.
10	28	Since early childhood	Psychopathic personality with violent hysterical outbursts	Unsuccessful insulin and convulsion treatment	,,	,,	3 years	—	Streptococcal stomatitis and dermatitis (? nutritional deficiency).

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cingular cortex, thalamus, hypothalamus and possibly the hippocampal region in the temporal lobe are important in relation to emotion, emotional expression and personality organization (*cf.* Meyer, 1944).

We have not been able to procure, in time to be included in this paper, a full account of the technique employed by the various neuro-surgeons who have operated on our cases. We have, therefore, no adequate knowledge of the criteria used in order to determine the place of introducing the leucotome, nor are we informed about special intentions which guided the surgeons. Dax (1943) has commented on the "alarming discrepancies between the actual point of the insertion of the leucotome and the desired point," if the surgeon relies upon surface markings only. McKissock (1943) is of the opinion that there will always be—even with improved technique—some degree of variation in individual cases, not only as regards the plane of the cut, but also as regards differences of depth of the cut, completion of the circular movement of the leucotome (if the Watts technique is used), and different amounts of haemorrhage, softening or scarring on one or both sides.

This scepticism is borne out by our pathological experience. In Fig. 6 the plane of the cut in all our nine cases of leucotomy is indicated; the striking variation in individual cases cannot be satisfactorily explained by deliberate surgical intentions. Fig. 1 (Case 1) shows a fairly well placed cut and an extensive all-round lesion of the white matter produced by the cut plus haemorrhage. The lesion extends well to the midline and has involved the cingular region, to which Freeman and Watts attached importance. The patient, however, died after six days from excessive haemorrhage and meningitis. In Case 3 (Fig. 7) the plane of the cut is fairly optimal, but only the lateral and dorsal aspects of the white matter have been severed, while the midline structures and the orbital areas have escaped. In the other hemisphere the cut has been placed in a slightly more rostral plane; the lesion is smaller, but occupies a similar position. In Case 5 the cut was placed too anteriorly; on the right side (Fig. 8) the whole white matter has been damaged, while on the left side the main lesion is situated in the orbital and midline parts, while the dorsal and lateral parts have been less involved (Fig. 9).

A cut in too posterior a level has been recognized as leading to unfavourable clinical results. The chance of cutting thalamo-frontal fibres is slender, as the fibres, in their backward course, soon converge to a small compact bundle which runs in the neighbourhood of the septum pellucidum to enter the ventromedial parts of the internal capsule. In order to cut the bundle in this place too many important structures would be involved, damage to which probably accounts for the unfavourable clinical result. Cases 2 and 4 are examples of a too posterior cut. Figs. 10*a* and 12 demonstrate that in both cases fairly symmetrical damage has been caused by the cut to the anterior horn and the antero-dorsal aspects of the striate body and internal capsule. The haemorrhage and its sequelae have involved, in both cases, the white matter of the posterior—granular and agranular—frontal lobe, and laterally extend even into the opercular and insular regions. But whereas in Case 2 the orbital region has been severely affected at the point near the septum likely to involve severance of the thalamo-frontal bundle (Fig. 10*b*), the orbital region is spared in Case 4 (Fig. 11).

Severance of thalamo-frontal fibres leads to retrograde cell degeneration in the nucleus medialis dorsalis of the thalamus (Figs. 13, 14), and this is the best method of assessing the damage done to this fibre system. Tracing of myelin degeneration is less reliable, as the thalamo-frontal system has only a poorly developed myelination (Walker, 1938). Investigations by Glees, A. Meyer and M. Meyer (so far unpublished*) have shown that it is possible to trace the degeneration of the terminal unmyelinated fibres of the thalamo-frontal and fronto-thalamic pathways, but a quantitative assessment will be difficult because of the use of silver impregnation methods. Freeman and Watts (1944*b*) briefly state that in their fatal cases about 75 per cent. of the nerve cells in the parvicellular portion of the nucleus medialis dorsalis had been destroyed, but they do not indicate whether and in what proportion their material includes recovered cases. In order to obtain a more accurate quantitative assessment we have counted the remaining cells in three coronal levels of the nucleus medialis dorsalis, and compared the results with those in a normal brain and in the one (Case 6) in which a complete severance

* To be published in the *Journal of Anatomy*.

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of thalamo-frontal fibres had been accomplished by frontal lobectomy. Counting was done in each level throughout the whole extent of the nucleus medialis dorsalis (parvicellular part), the thickness of the section being 20μ, and the figures obtained were calculated for unit areas. The results have been compiled in Table II :

TABLE II.—*Dorso-medial Nucleus (cells per unit area).*

	Anterior portion.	Degeneration. %.	Middle portion.	Degeneration. %.	Posterior portion.	Degeneration. %.
Normal . . .	22	—	19·8	—	14·8	—
Case 1, 6 days . .	11·5	48	21	0	13·6	8
,, 2, 3 days . .	13	41	11·1	44	11	26
,, 3, 2 months . .	12·7	43	9·6	52	10	33
,, 4, 4 months . .	16	27	8	60	12·7	14
,, 5, R., 17 months .	14·3	35	11·8	41	15·7	0
,, 5, L., 17 months .	11·7	47	15·9	20	15·8	0
,, 6, 6 weeks . .	4·6	79	6·3	68	11	25

It is seen that in the case of lobectomy the degeneration is not complete, either because during the survival period of six weeks not all the cells have been destroyed, or because a small proportion of the cells is not concerned with the projection to the prefrontal cortex. In the leucotomy cases the loss of cells is still less complete. It is surprising to find a considerable loss in Cases 1 and 2, both of which survived the operation for only a short time. Further analysis revealed, however, that the cells had not actually disappeared, but as a sign of early degeneration were only slightly stained and thus escaped being counted. The obvious difference in the degree of severity of cell loss in the antero-posterior axis of the nucleus will be discussed elsewhere.

Unfortunately a similar analysis is not available for the four recovered cases of our series. Two of the cases (7 and 8) were investigated by Prof. Le Gros Clark, who kindly communicated his observations to us ; in the remaining two (9 and 10) only a macroscopic examination has so far been made.

The first (Case 7) was an excitable schizophrenic. Prior to the operation the mental illness had been apparent for at least three years. Throughout the survival period of eight months following the operation the patient was much quieter, less aggressive and easy to manage, although towards the end there was an occasional recurrence of violence. In this case the operation had resulted in an appreciable severance of thalamo-frontal fibres on only one side. The orbital and midline areas had almost entirely escaped, and there was only patchy damage in the nucleus medialis dorsalis of the affected side, while the contralateral nucleus was unaffected (Fig. 15).

The second recovered case (No. 8 of our series) was a typical paraphrenia with little personality deterioration after five years' duration of the attack. After leucotomy he was much better in every way, less excited, his hallucinations and delusions far less obvious. The following note was made seven months after the operation : " It is a great pleasure to see him, walking about on parole with other patients, laughing, happy and friendly. So far a great success." There was no relapse, but he died from carcinoma of the oesophagus sixteen months after the operation. In this case leucotomy was performed in a very posterior plane (Fig. 16), and merely resulted in cutting through the operculum, insula, external capsule and claustrum. The thalamo-frontal connections had not been severed, and the nucleus medialis dorsalis was preserved.

The third recovered case (No. 9 of our series) suffered from schizophrenia with symptoms of suicidal depression, hallucinations and delusions. He remained almost inaccessible until the leucotomy, which was performed in August, 1943, at least three years after the onset of the psychosis. The condition improved rapidly, he talked rationally and showed appropriate emotional response. He denied hallucinations, and there was no evidence of persistent delusions. He worked well in the stores, doing clerical work and weighing. He died in April, 1945, probably from pulmonary tuberculosis. Macroscopic examination (Fig. 17) of the brain revealed a fairly symmetrical lesion occupying the white matter of the inferior frontal gyrus at the level of the genu of the corpus callosum. The lesion is a slit-

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like, smooth-walled cyst and stops ½ cm. lateral of the dorsal angle of the anterior horn. In the antero-posterior direction its extent is not more than 1½ cm. The anterior horns have not been opened and the midline structures, including the fasciculus cinguli, have not been damaged. It may be expected that a large number, if not most, of the thalamo-frontal fibres have escaped, partly owing to the circumscribed nature of the lesion, partly to the rather dorsally placed cut.

The last recovered case (No. 10 of our series) was a woman, aged 28, who since her early childhood had been subject to very gross hysterical outbursts of shouting, screaming and violent impulses. Prefrontal leucotomy was performed in February, 1942. She made an uninterrupted recovery. She still had outbursts, but they were much less frequent and much milder. In December, 1943, she was able to go home to her parents, who were very pleased with her. She held a few light jobs. About six months before her death she developed a streptococcal stomatitis and dermatitis, and died from broncho-pneumonia on February 21, 1945. The anatomical effect of the prefrontal leucotomy is shown in Fig. 18. The lesion is situated at the level of the genu of the corpus callosum in front of the anterior horns, and occupies fairly symmetrically the deep white matter corresponding to the inferior frontal gyrus. Its antero-posterior extent is probably not more than ½–¾ cm. On the right side a few small cysts are seen, while on the left a slightly yellowish scar is all that remains. A greyish colour of the white matter of the orbital gyri might indicate a slight gliosis. A forecast as to the effect of the lesion upon the thalamo-frontal projection is more difficult in this case than in the previous one, but it is quite likely that a large number of these fibres have escaped, as has also the region of the gyrus cinguli and fasciculus cinguli.

A final analysis of the factors that are responsible for recovery or failure must wait until a sufficiently large material has been investigated. Some interesting points emerge, however, from the comparison of the three unrecovered cases with a sufficiently long survival period (Cases 3, 4 and 5), and Cases 7–10, in which a notable degree of recovery was observed. All the recovered cases were patients with little or only moderate deterioration. During the decisive period after the operation there were no clinical complications to interfere with recovery. The operation itself produced circumscribed lesions uncomplicated by severe haemorrhage and softening of any appreciable extent.

Among the three cases of the unrecovered group one (Case 5) was severely deteriorated. The two others (3 and 4) were little deteriorated and should have had a fair chance of recovery. However, in Case 3, uraemia, developing as a result of a hypertrophic prostate, nicotinic acid deficiency and a senile condition of the brain must be considered as adverse factors. In Case 4 the cut was placed too posteriorly, involving the agranular frontal cortex and the caudate nucleus. In addition, extensive haemorrhage had destroyed a considerable part of the white matter of the prefrontal lobe. One positive result of the operation was the complete disappearance of the delusions, but this was offset by the severity of the frontal lobe deficit syndrome (fatuous euphoria, drowsiness, incontinence), combined with symptoms arising from damage to other regions of the brain. Hypertensive disease may also have been an adverse factor. The patient died from a terminal Wernicke syndrome (thiamine deficiency), which was probably due to exhausting restlessness. In Case 5 (long-standing catatonia, severely deteriorated) the lesion was placed in too anterior a plane ; one might speculate that in this type of patient the cutting off of a larger portion of the frontal lobe would have achieved a better result, despite the post-operative epilepsy.

As regards the recovered group, it is surprising how little damage was sufficient to produce a remarkable clinical improvement. The cut in these cases was, as far as we can judge at present, incomplete in regard to severance of the thalamo-frontal fibres, and in none of the cases had the midline structures, including the fasciculus cinguli, been cut. In one of these cases only a unilateral (incomplete) severance of thalamo-frontal fibres had been achieved, and in another the prefrontal lobe had been entirely spared, the cut involving merely the opercular region, insula and the claustrum.

From this it follows that in suitable (non-deteriorated) cases a good recovery may follow rather surprisingly incomplete and circumscribed cuts in the white matter of the prefrontal lobe. In a similar type of case recovery may be prevented by an excessive lesion, either by cutting in too posterior a plane, or by causing

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extensive haemorrhage. The avoidance of haemorrhage seems to be a major necessity, and it may well be wise tactics for the neuro-surgeon to sacrifice a measure of completeness in favour of safety. On the other hand, deteriorated cases with fixed and automatized symptoms seem to require a more substantial severance of fibres, as instanced by Case 5. This is in accordance with the views of Freeman and Watts (1944*a*), who found that " well integrated individuals with disabling tension states but with no schizoid distortion respond to minimal interruption, while schizophrenics, chronic obsessives, hypochondriacs and long-term involutionals require the placement of lesions far posterior in the prefrontal region." In practice it will not always be easy to strike the right balance, both for the clinician, who has to make a careful study not only of the psychotic syndrome but also of the premorbid personality, life history, adaptability, etc., and for the neuro-surgeon who, with the methods available at present, is never quite sure in what plane he is introducing the leucotome and what amount of damage he will cause.*

In our material, involvement of the midline structures including the fasciculus cinguli has not proved to be an essential condition for recovery. This is also of some practical importance, as Knight (1943, his fig. 3) has demonstrated that if the leucotome is introduced too near the cortex, a haemorrhage may be caused during the circular movement by opening one of the arteries in the depth of a sulcus.

Recovery may follow unilateral prefrontal leucotomy, although in Case 7 there was a short recurrence of symptoms during the terminal disease. And finally, a good recovery was achieved by a lesion entirely outside the prefrontal cortex. We do not believe that this discredits the rationale of the operation. Even if it should be proved that damage anywhere in the brain might have a beneficial effect in a number of cases, it would be difficult to conceive of a theoretically and practically more rational place for surgical intervention than has been suggested by Moniz. Experiences of this kind emphasize, however, that the severance of a particular fibre system is perhaps not the only factor, and that others (anatomical, physiological and psychological) may, to a varying degree, contribute to the success of the operation. In this connection observations made on depressive patients who, in suicidal attempts, had inflicted brain injuries upon themselves, are of great interest. In the course of a clinical investigation of such cases Guttmann (1943) has shown that recovery may take place without any damage to the frontal lobe: " General damage to the brain and effect of injury and sickness on the one side, and on the other the release of tension, the substitution of recognized physical illness for hidden mental incapacity, the experience of interrupted consciousness and amnesia, finally the change of the life situation brought about by the injury, combine in bringing about the mental change." Most of this is applicable to the conditions of leucotomy, with the reservation, perhaps, that often the operation is not considered serious by the patients (Frank, 1945). Frank explains this by the assumption that the frontal lobes do not appear in the body image.

The Orbital Cortex in Relation to Prefrontal Leucotomy.

The fact, first established by Le Gros Clark in 1932, that the nucleus medialis dorsalis projects to the prefrontal cortex, is now generally recognized, but the detail of this projection has for a long time been obscure and controversial. In 1940 (*a*, *b*) Walker made detailed experimental investigations in monkeys, and came to the conclusion that—roughly—fibres originating in the medial part of the nucleus medialis dorsalis project to the orbital area of the prefrontal cortex, while those from the lateral half go to areas nearer the convexity, viz. a dorso-ventral axis of the prefrontal lobe corresponds to a latero-medial axis of the nucleus medialis dorsalis. We have been able to show that a similar arrangement exists in the human brain. If, owing to the haphazard nature of the operation, the orbital regions were spared, retrograde degeneration was more or less confined to the lateral aspect of the nucleus medialis dorsalis (Figs. 7, 19). On the other hand, in Case 5, in which the convexity of the frontal lobe was less involved, the retrograde

* We deliberately abstain from discussing the relative value of the different techniques of prefrontal leucotomy. This is for the neuro-surgeon to decide, and our task is confined to providing pathological facts as a basis for his consideration.

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degeneration was situated in the medial half of the nucleus (Figs. 9, 20). Degeneration involving the whole of the nucleus medialis dorsalis was seen in Case 6 (Fig. 21), in which by frontal lobectomy all fibre connections were interrupted. It is interesting to note that the degeneration in the medial half is more intensive than in the lateral half. Possibly not all the cells in the lateral half project to the prefrontal cortex, and there is, thus, some suggestion that, as a whole, the projection to the orbital area is more massive than to the areas nearer the convexity.

The most medial part of the nucleus medialis dorsalis, the so-called pars magnocellularis, was originally considered not to participate in cortical projection (Le Gros Clark and Boggon, 1935; Freeman and Watts, 1942, 1944*b*). Recent observations,

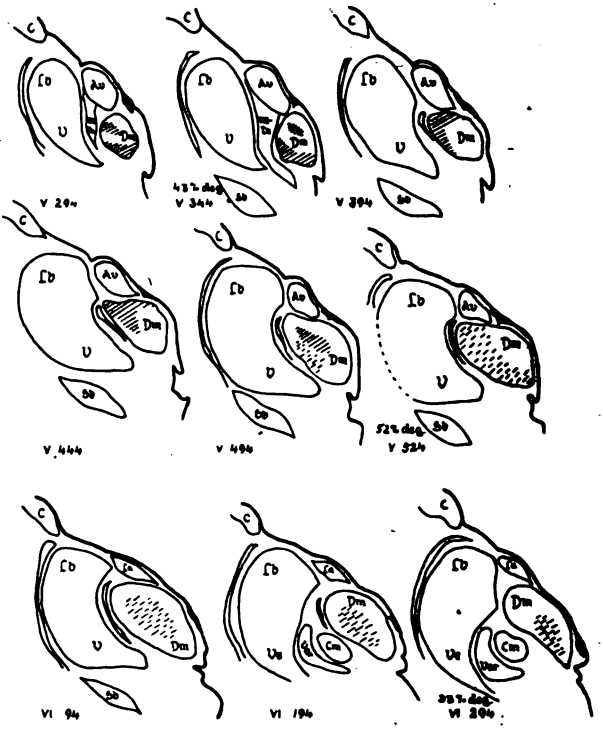

FIG. 19.—Case 3: L. hemisphere. Diagram of various coronal sections through the thalamus. The shaded areas indicate the extent of the degeneration in the nucleus dorsalis medialis.

however, made by Walker (1940*b*) in monkeys and by Le Gros Clark and Russell (1940) in a human case of complete cortical hemiatrophy have definitely established a cortical projection arising from this nucleus. Walker (1940*b*) assumes that it projects to the orbital region (area 11 of Brodmann). In our human material so far investigated a considerable degree of retrograde degeneration in the pars magnocellularis was seen in only Cases 5 and 6, and in these the damage to the orbital region was severe. This is of double significance as, in the first place, it increases the relative magnitude of the thalamo-orbital projection, and, secondly, owing to the recognized relation of the magnocellular nucleus to the hypothalamus, suggests the existence of a relatively direct hypothalamo-prefrontal connection, the only one which, so far, has been definitely established.

The relative strength of the projection to the orbital cortex is of some practical interest. It tends to lend additional weight to views expressed by Dax (1943), McKissock (quoted from Fleming, 1944) and others, that it might be desirable to ensure thorough cutting of fibre connections with the orbital areas. Hoffstatter,

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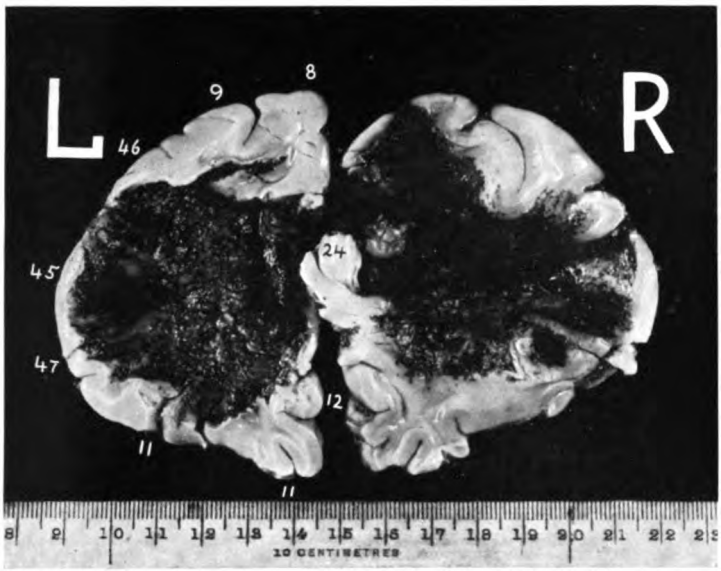

FIG. 1.—Case 1: Note the extensive haemorrhage occupying the whole of the white matter and involving also part of the cortex. The figures indicate Brodmann's areas.

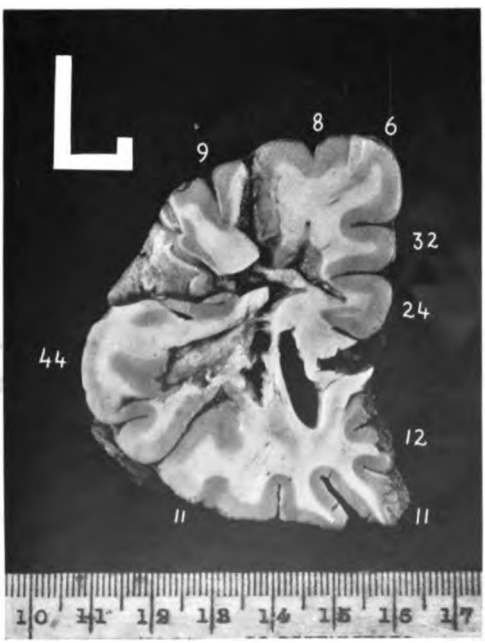

FIG. 2.—Case 4: The white matter of the posterior frontal lobe has been converted into an extensive area of cystic softening.

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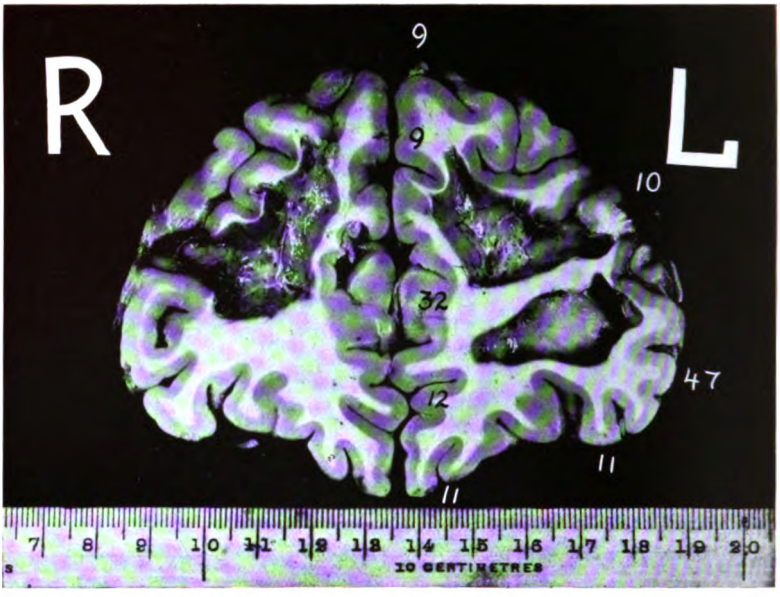

FIG. 3.—This photograph is taken from a case not included in the present series. Note the large cysts into which an earlier haemorrhage has been converted.

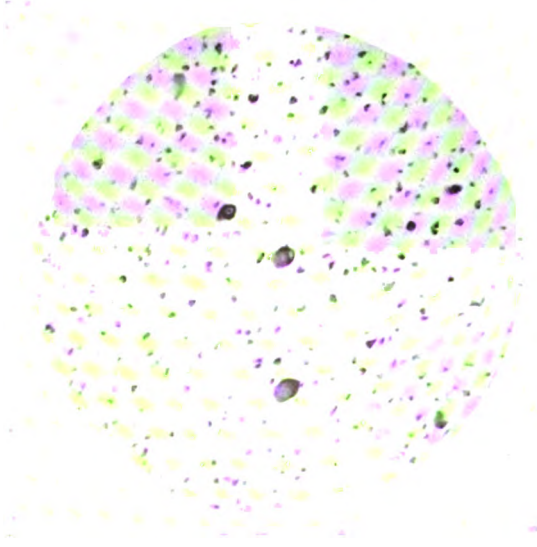

FIG. 4.—Case 3: Nissl stain, × 70. Betz's cells of the precentral regions showing typical retrograde degeneration.

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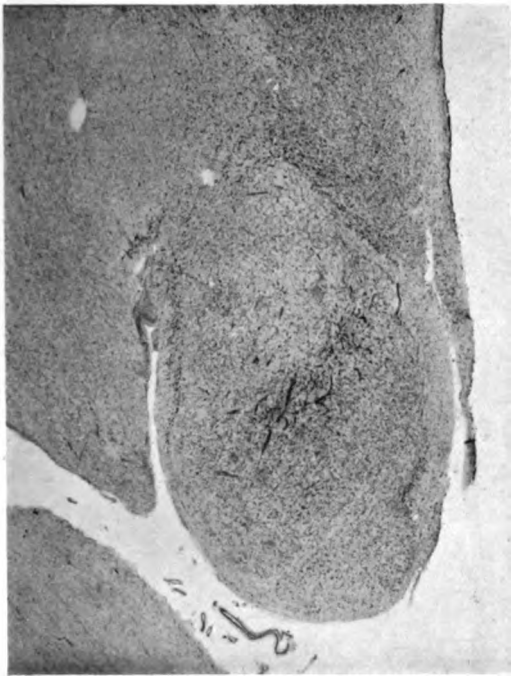

FIG. 5.—Case 4: Nissl stain, × 9·5. The centre of the mamillary body contains glio-mesodermal proliferation and small haemorrhages. (Wernicke's syndrome.)

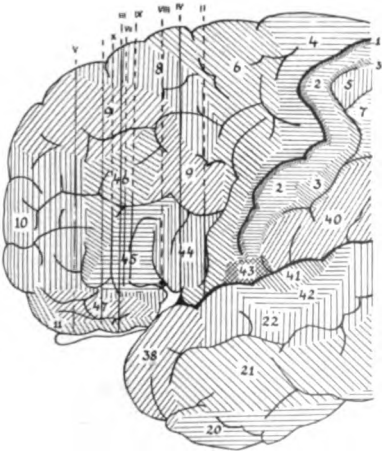

FIG. 6.—The plane of the cut in all cases has been indicated as continuous lines. The numbers on top refer to the cases.

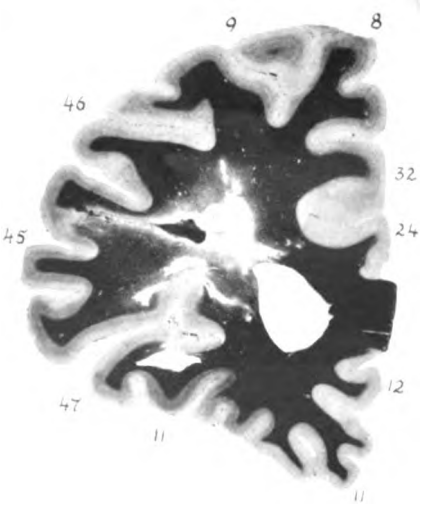

FIG. 7.—Case 3: L. hemisphere, Heidenhain's myelin stain, × ·9. The lesion appearing as demyelination occupies in this plane the white matter corresponding to areas 46, 45 and 47; rostrally it extends also into the white matter of the areas 9 and 8. The midline structures and the orbital area are spared.

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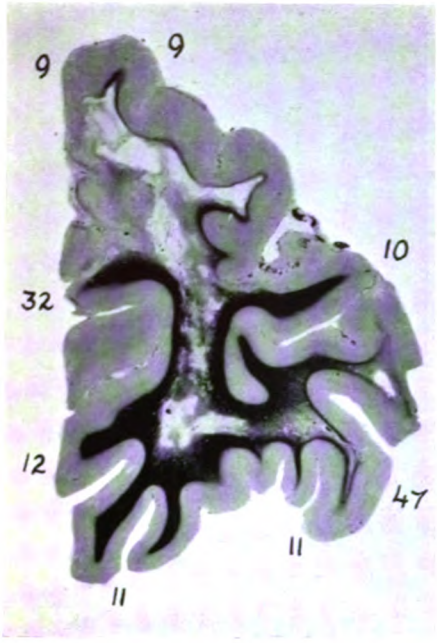


FIG. 8.—Case 5 : R. hemisphere, Heidenhain's myelin stain, × 1·4. The demyelination extends in this plane throughout the white matter, petering out rostrally towards the intact frontal pole and backwards towards the tip of the anterior horn, which is not involved.

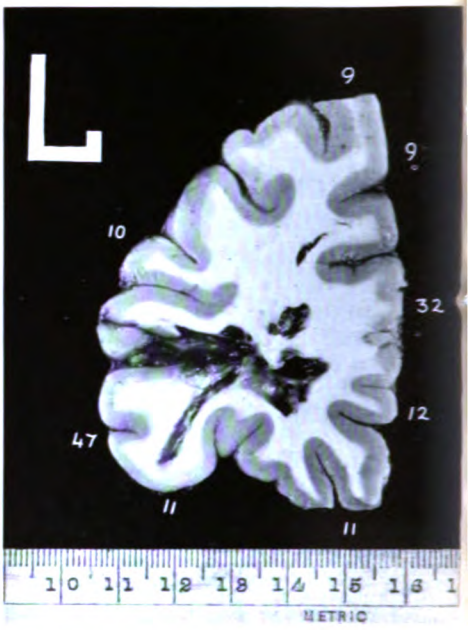
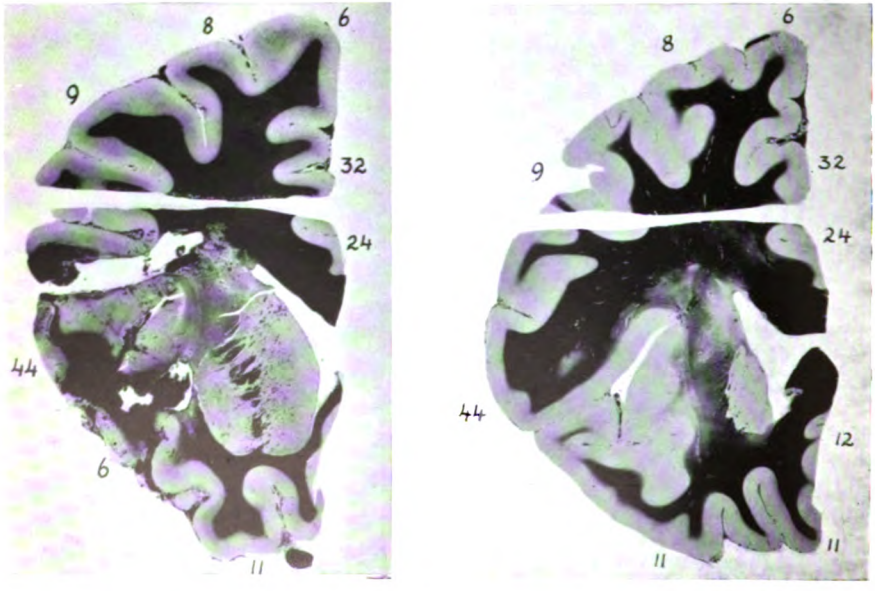


FIG. 9.—Case 5 : Left hemisphere. At this level the lesion occupies the white matter of the orbital region (areas 11, 47, and ventral part of 10). In front of this plane it is somewhat more extensive both dorsally and towards the midline, but the convexity is spared throughout.



a *b*

FIG. 10.—Case 2 : L. hemisphere, Heidenhain's myelin stain, × ·9. (*Vide* description in the text.)

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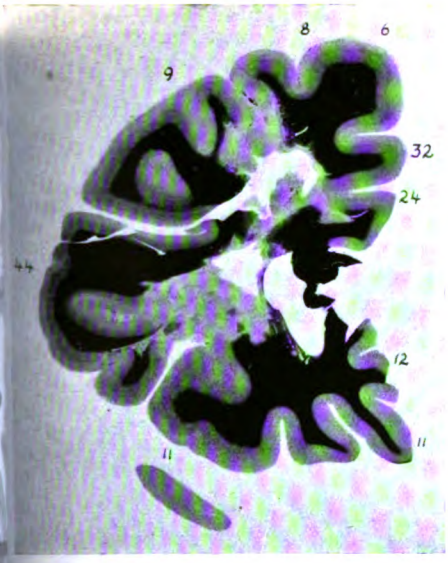


FIG. 11.—Case 4 : L. hemisphere, Heidenhain's myelin stain, × ·8. (*Vide* description in the text.)

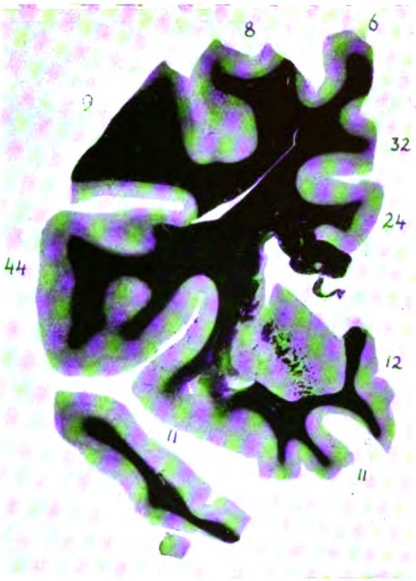
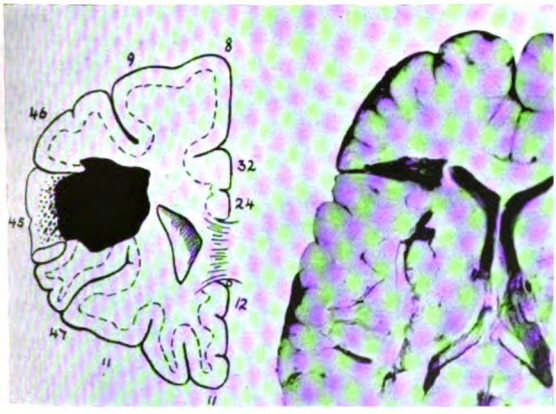


FIG. 12.—Case 4 : L. hemisphere, Heidenhain's myelin stain, × ·8. (*Vide* description in the text.)



b *a*

FIG. 15.—Case 8 : (*a*) Horizontal section of the brain indicating the small, slit-like cyst, which does not reach the anterior horn. (*b*) Diagram of a coronal section showing that the convexity, midline structures and the orbital region were spared.

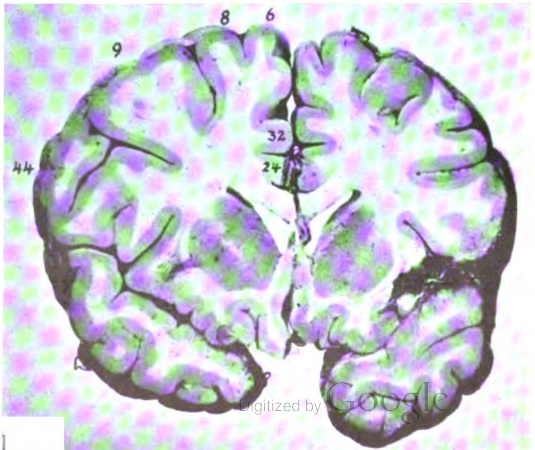


FIG. 16.—Case 8 : Note the small bilateral lesions in the opercular and insular region. The striate body is not involved.

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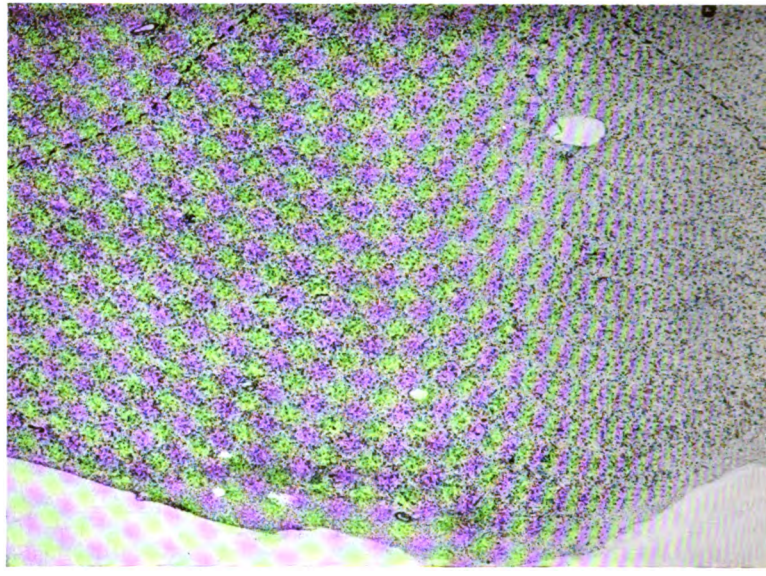

FIG. 13.—Nucleus medialis dorsalis, Nissl stain, × 11. Normal control.

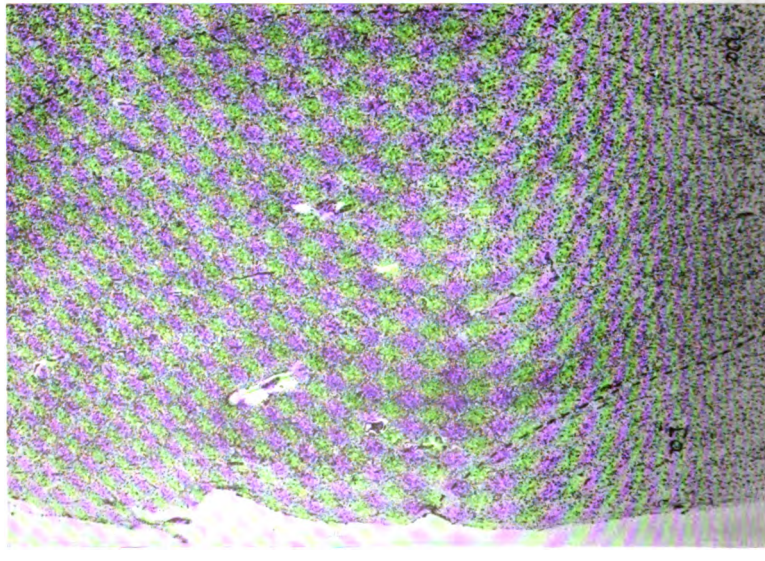

FIG. 14.—Nucleus medialis dorsalis, Nissl stain, ×11. Note the degeneration and gliosis in the parvicellular portion of the nucleus, after prefrontal leucotomy.

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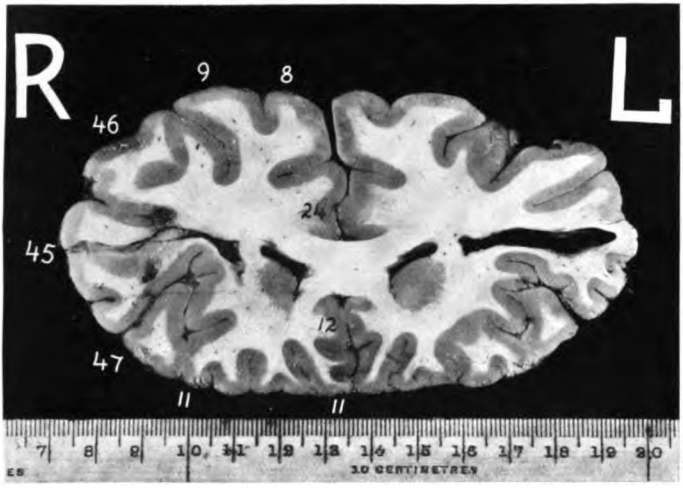

FIG. 17.—Case 9: Note the slit-like and circumscribed bilateral cysts, which do not reach the anterior horn.

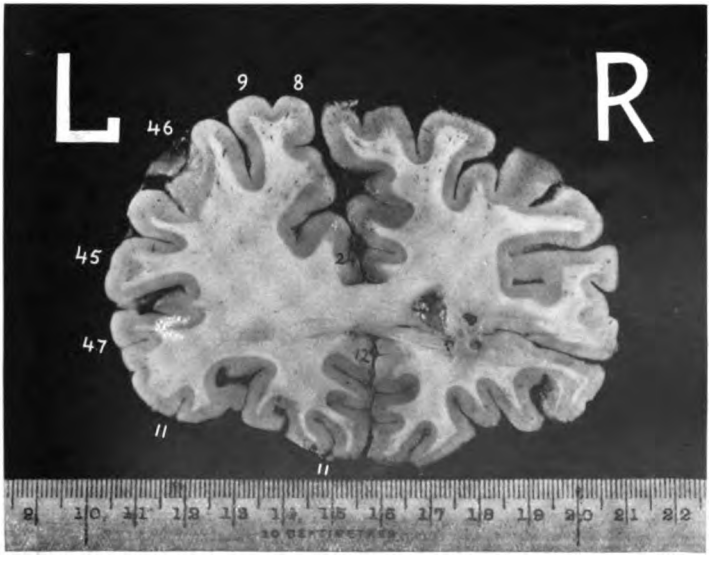

FIG. 18.—Case 10: Circumscribed bilatera scars and, on the right side, small cysts in a plane just in front of the tip of the anterior horn. The lesions are situated in the orbital part of the prefrontal lobe.

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a *b*

FIG. 22.—Centre median nucleus, Nissl stain, × 13. (*a*) Normal appearance in a case of schizophrenia of 20 years' standing. (*b*) "Atrophy" of the nucleus in a more recent case of schizophrenia.

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Smolik and Busch (1945) have recently sectioned the orbital quadrants only and, in contrast to earlier attempts (Freeman and Watts, 1942), claim satisfactory results in a series of 22 patients. It will be interesting to see whether these results can be confirmed in a larger series and by other investigators. From our point of view (as outlined in the previous paragraph) it would be a definite advantage to be able to section a large proportion of thalamo-frontal fibres by means of a fairly circumscribed operation.

Atrophy of the Prefrontal Cortex.

Freeman and Watts (1942, 1944*b*) did not find any appreciable loss of nerve cells in the portion of the prefrontal cortex which had been cut off by leucotomy,

FIG. 20.—Case 5: L. hemisphere. Diagram of various coronal sections through the thalamus. The shaded areas indicate the extent of the degeneration in the nucleus dorsalis medialis.

and they consequently assumed that the fronto-thalamic projection, though known to exist, must be fairly insignificant. They also failed to discover much Marchi degeneration of fibres going to the thalamus, but, as the myelination of these fibres is poor, this might not prove much. In all our leucotomy cases with a sufficiently long survival period, no significant degree of macroscopic atrophy was seen. Histological investigation, however, revealed a slight loss of cells, especially in the third layer, which looked emptier. This was particularly apparent when photo-micrographs of the affected cortex were compared with one taken from the same area of a normal control. Cell counts confirmed this visual impression (Table III). The table shows that there is a definite though not severe loss of cells, and that this loss is, again, most marked in the orbital region. The interpretation of these findings, which are not yet complete, is still under consideration. If confirmed on a large

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TABLE III.—*Frontal Lobe, Cell Count (3rd layer, 4 mm. length).*

	Vertex area 9.	Degeneration. %.	Lateral surface area 46.	Degeneration. %.	Lateral orbital surface area 11.	Degeneration. %.	Medial orbital surface area 11.	Degeneration. %.
Normal .	1,136	—	1,240	—	1,166	—	1,238	—
Case 1, 6 days .	1,500	0	1,404	0	1,286	0	1,324	0
Case 2, 3 days .	1,134	0	1,282	0	1,012	13	1,044	16
Case 3, 2 months .	964	16	922	25	758	35	660	47
Case 4, 4 months .	955	16	930	25	870	26	875	29
Case 5, L., 17 months .	1,312	0	1,536	0	1,130	3	1,100	11

scale, they might indicate that the fronto-thalamic pathway, though definitely inferior to the thalamo-frontal, is not quite insignificant, and that more fibres originate in the orbital areas than in the convexity.

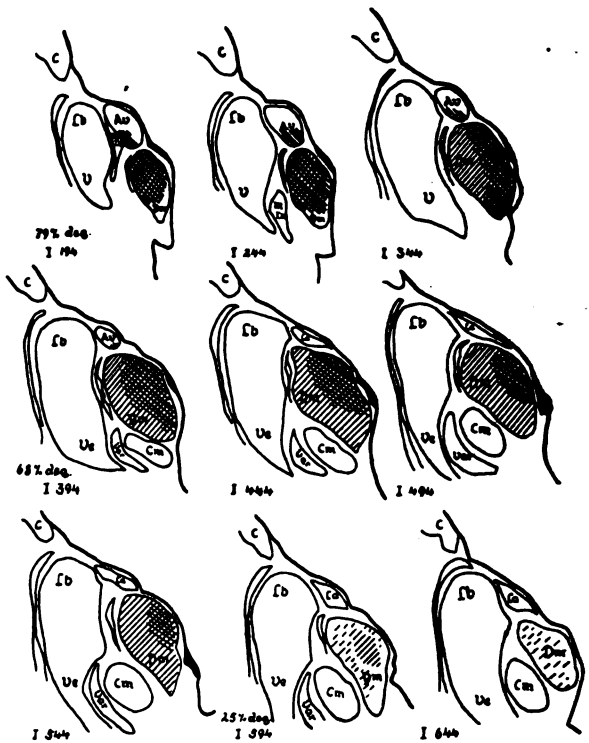

FIG. 21.—Case 6: L. hemisphere. Diagram of various coronal sections through the thalamus. The shaded areas indicate the extent of the degeneration in the nucleus dorsalis medialis.

Centre Median Nucleus of the Thalamus.

Whereas it has been established that almost all the thalamic nuclei project to the one or other region of the cerebral cortex, there is one notable exception—the centre medial nucleus. Nor is anything definite known about the connections of this nucleus with other centres of the brain. The consensus of opinion at present seems to be that the centre median nucleus is purely a thalamic association centre

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(Le Gros Clark, 1944). What appears to be a bilateral selective atrophy of this nucleus is, therefore, a surprising and unexplained finding. It has been recorded in a case of cortical deafness with lesions in the opercular and insular regions (Le Gros Clark and Russell, 1938). A similar "atrophy" was recently seen by Le Gros Clark (personal communication) in a psychotic patient after leucotomy. Independently we have made similar observations in brains from psychotic patients. For a moment it was tempting to consider a possible relationship of the pathology of this nucleus to functional psychosis. However, further observations made by both Le Gros Clark and the present writers have not substantiated a clear-cut relation to any form of psychosis. Figs. 22, *a* and *b*, demonstrate that in a fairly recent case of schizophrenia there may be almost complete "atrophy", while in another of twenty years' duration of the illness the nucleus appears to be normal. The centre was also normal in the case of frontal lobectomy in a mentally healthy patient. The only conclusion we can safely draw at present is that, under both normal and psychotic conditions, the centre median nucleus is liable to very considerable variations in cell density and spacing of cells, which apparently far exceed those seen in animal brains by Le Gros Clark and Boggon (1935). This variability is of remarkable interest if one regards the nucleus as an association centre within the thalamus, which itself appears to be one of the corner-stones of what one might call the anatomical substrate of personality organization. It is the more remarkable, as previous work on individual architectural differences within the cerebral cortex has demonstrated the relative constancy of the cortical pattern. Individual thalamic variation has not gone entirely unnoticed. Alexander (1942) has commented on individual differences of the myeloarchitectural pattern of the normal thalamus, and he has made the statement that " human thalami are almost as different in appearance as human faces." Here indeed seems to emerge a problem of the first magnitude which will require serious attention.

Summary.

A pathological investigation has been made in nine cases dying after prefrontal leucotomy, and in another case in which a frontal lobectomy was performed in order to remove a meningioma.

It has been shown that the place at which the leucotome was introduced into the brain and, also, the amount of haemorrhage and its sequelae varied considerably in the individual cases.

In the four recovered cases the lesion was surprisingly incomplete and circumscribed, and did not involve structures near the midline. In one case considerable improvement followed unilateral leucotomy; in another the prefrontal lobe was not involved at all.

There is some evidence that the projection of thalamic fibres to the orbital region is of considerable strength, and that the cortex in front of the surgical lesion is not wholly unaffected.

The centre median nucleus of the thalamus displays in the human brain a considerable variation of cell density. Its significance requires further investigation.

The results have been discussed with regard to both the clinical selection of cases for leucotomy, and the theory and practice of the operation, but final conclusions should be deferred until more material has been investigated.

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DISCUSSION.

The PRESIDENT said that Dr. Meyer had, as usual, been most instructive. This operation had always appealed to him as being the beginning of greater and newer techniques, and in the nature of things it had the element of crudity which in time would be smoothed out, and it would become more exact. Dr. Meyer had given some indication of the gradually increasing lesson of experience, and how the operation would have to be improved for it to be useful and to meet the requirements of cases. In fact it would be a development of neurosurgery.

Dr. Meyer lamented the small number of cases, but of course, the operation would die a natural death if he had a large amount of material. The material, if the operation was to go on and progress, would obviously be limited, and it was hoped that information would be gained from intercurrent cases rather than from direct action, because one of the effects of his investigations would obviously be to make the operation safer by improving the technique of the surgeons, both with regard to life-saving as well as performing the neuro-psychological functions which was the whole basis of the operation.

A number of the members had had cases of leucotomy, and he hoped the debate would be interesting and instructive. Those who had had good practical experience would add to the existing knowledge on this subject.

Dr. MCCARTAN said that one of his cases had been demonstrated by Dr. Meyer and he regretted that more neuro-surgeons were not present, because this was one of the most important papers read before the Association for some time. It was not often that one attempted such a faithful post-mortem investigation of one's patients, and he hoped when the paper was published that as many of the pictures shown during his reading of it would be published as possible, so that surgeons performing the operation could see what Dr. Meyer had demonstrated.

In his own case, the patient did not die of the operation, but because he had been allowed to go to operation with an enlarged prostate. In the actual operation, it was obvious from what Dr. Meyer had said that the surgeon had not been quite radical enough.

He congratulated Dr. Meyer on his very excellent and enjoyable paper.

Dr. CUNNINGHAM DAX said that he wished one could see more of these cases, so that one could see where the approach was made and the extent to which the brain was cut. He understood that an orbital section case had died quite recently on whom the operation was performed some time ago. The patient was an aged melancholic and did not show the improvement which was hoped for, and which it appeared might follow in the first period after the operation. When looking at the section in the first place and wondering how it could be done, both the vertical section, as one had hoped in front of the tip of the ventricle and also a horizontal section above the orbital cortex by the same incision, one found post-mortem investigation very useful. He had been informed, and indeed believed, that the position of the brain did shift in relation to the skull, and, of course, one had a proportion of older cases to investigate, and he had found the position at which the leucotome was inserted and cuts were made all over the brain. Having examined cases which died, one was also fairly shaken by the position of the incision, and that led to the adoption of a different approach through the temporal fossa where one could, on each occasion, see what was happening when the incision was made. It would be very interesting to see the distribution of the orbital fibres although, that being the older portion of the brain, he was told that one would have expected the results which had been described.

There was no doubt that some amazing results had been seen in cases of aged depressives with stereotyped speech. One was of an old lady who repeated that she "wanted to go to London," and got very upset about it, was constantly struggling and was difficult to nurse, but who settled down a little after the first vertical operation. Some months afterwards a horizontal section was done through another incision, and she had cleared up and had been at home for about 18 months. In another case of the same type the horizontal section was done in the first place, and she also cleared up and had been at home for roughly the same time.

With regard to the distribution of fibres and the path they took to the thalamus, he wondered whether a mistake was made by cutting two vertical sections and so missing a number of the fibres as they went from certain portions of the cortex back to the thalamus, and if something like a grape-fruit knife could be used in order to make a curved incision over the point of the

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lateral ventricle where one cut the greater number of fibres. An endeavour was being made to produce an instrument which might do this and he would report the results at a later date.

Dr. Dax hoped there would be an opportunity for seeing more and more of the results as time went on, mapped out in the very beautiful way in which Dr. Meyer had done it so that it would be possible to improve, correct and adjust, and make progress in this useful treatment.

Dr. MAYER-GROSS said that he had looked forward to this paper for some time, not only to see some old acquaintances on the screen, but also because it was of the greatest importance for the treatment that the pathologist should control the actions which produced the results.

He would like to ask a question on a point he had discussed with Dr. Meyer and which he deliberately left out of the paper—the question of how far the cortex itself, which, according to Freeman and Watts, showed no deterioration whatsoever and should be in a perfect condition, was, according to Dr. Meyer's findings, affected by the operation, and was responsible for the changes brought about by the operation. If the connection with the thalamus was of such importance it might depend not only on the nucleus of the thalamus, but also on the effect on the cortical layers.

Dr. F. A. PICKWORTH said that Dr. Meyer stated he was unable to follow the degeneration of the myelin sections. Did that mean that a large portion of the fibres which were cut were sympathetic fibres, and would that explain the peculiar visceral effects from prefrontal leucotomy?

Dr. R. B. TURNER said that it was difficult to exaggerate the importance of Dr. Meyer's contribution on this subject. The more one thought about it the more extraordinary it seemed that a mutilating operation on the brain could bring about mental improvement. What interested him most in Dr. Meyer's description was the case in which the patient—he thought it was Case 5—survived for 17 months or was very much improved although the operation was a failure from the point of view of its object, which was to sever the fibres connecting the dorso-medial nucleus and the prefrontal region. One wondered whether, as Dr. Meyer hinted, it mattered where the incision was made, and whether an incision in the occipital region would not have the same effect, whether the actual severance of the fibres was of such importance. Instead of dividing fibres rather blindly, could not one, through electrical means, destroy the dorso-medial nucleus of the thalamus? Neuro-surgeons seemed to be able to turn the brain inside out nowadays, and no part was inaccessible.

Another question which occurred to him was whether the surgeon had merely been content to do leucotomy on one-half of the brain, perhaps a right-handed individual on the left-hand side, and had the result been in any way satisfactory? The idiot was not troubled by projecting himself into the future or disturbance of his superego, as far as was known, but he was often very disturbed and disagreeable, and it occurred to the speaker that he would be a very satisfactory subject for this operation. At Leavesden leucotomy had been performed on many mental defectives; only two were high-grade, others being almost in the idiot class, and although there was not sufficient time to judge of the results, and one patient who was rather feeble-minded and whose voice could be heard through several blocks of the building before the operation, and who threw his utensils, his food and even his faeces about the ward, was now able to be put on parole. He was anaplegic, probably suffering from spina bifida, and he propelled himself about the grounds. One idiot diplegic, who spent all her waking hours destroying either the bedding or her clothing with her teeth to such an extent that she did £90 worth of damage in six months, had been remarkably improved and had ceased, except occasionally after an epileptic fit, to continue these acts of destruction. It must not be thought therefore that this was an operation suitable only for the psychotic or psycho-neurotic subject. It obviously had a field of usefulness in the mental deficiency institution. He believed that at the sister institution at Caterham equally disturbed patients made an even greater response.

Dr. BURROWS asked Dr. Meyer whether his investigations threw any light on vitamin deficiency in the immediate results of the operation. One of his cases, after weeks of post-operative confusion, cleared up to almost complete normality in three days with the administration of nicotinic acid, and he would be interested to know of other cases.

Mr. CLARK-MAXWELL (visitor) said that it had occurred to some neuro-surgeons that a direct approach to the dorso-medial nucleus would be a more rational thing to do than to attempt to section the frontal fibres with the great variation in results, both technically and mechanically. Brains varied very much; one did a sweep of 19° on one brain and a similar sweep in another and afterwards one found that the sweep was 30° in one and 70° in another owing to the different elasticity of the fibres.

It was very difficult to get at the dorso-medial nucleus, and he had been doing some experiments lately which were still in the early stages and still restricted to the cadaver. It was possible by an approach to introduce a small scoop into the ventricle, and one could see the degree of the outline of the thalamus and some of the landmarks therein. He had used a coloured dye to follow the track of the instrument, and found that that method was more variable than attempting to section the frontal fibres. The method was improved, but it was too early to say whether it was satisfactory. It should be the right thing to do, but so far skill was insufficient to hit the

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right spot with anything like certainty. If he could show some of the brains into which the dye had been put his hearers would be horrified.

One speaker mentioned getting a circular sweep round the hinder ventricle; he had done this in two or three cases but had found difficulty. With the ordinary ventricular cannula one could do a sweep, and it was possible to feel the wall of the ventricle before penetrating it.

Dr. BRODY said that he would like to hear a little more about the visceral and autonomic changes and what was the underlying neuro-pathology. It was very interesting; although one had seen recovery without very much in the way of visceral change he could not remember any case which had shown obesity which had not done well clinically.

The other point of interest was that one of the cases which Dr. Meyer had mentioned was one of two done at Runwell where the incision was made ½ in. posteriorly to the usual site. That did not mean that the actual brain was severed ½ in. posteriorly. One of the cases died. She showed very little in the way of outward visceral damage, whereas the other patient became extremely torpid, fat, very lazy, and had atrophic ulcers on her heels and atrophic changes to her hands which took about nine months to clear up. During the whole of that time she was excessively torpid, but as the atrophic changes cleared she got more animated. She remained like that for some months and then gradually relapsed and was much as she was previously, although she had left hospital in the meantime.

It would be very interesting to hear what Dr. Meyer had to say about the autonomic changes which occurred following leucotomy.

Dr. MEYER, in replying to the discussion, said that numerous questions had been asked, and he was glad that he had cut down his paper because he had already planned to discuss the questions which arose spontaneously.

He was sorry that he gave the impression that he expected a high mortality from leucotomy. Actually he did not think that the mortality was greater than that mentioned by Zeigler, but what he wanted to suggest was that it was of the greatest importance to remain in contact with the patients who recovered, and if they died later (and some would because many were elderly) their brains would be of the greatest value for this investigation.

Dr. Cunningham Dax mentioned the new methods of surgical approach, and he was very glad that the developments were making the cut more reliable. Dr. Mayer-Gross had asked about the cortex. There were few cases where there was atrophy in the frontal cortex. Freeman and Watts, in the eight cases which they reported, said that the frontal cortex was normal. He had made a special study of the frontal cortex, however, and had found that it was not quite normal. In all the cases with sufficiently long survival period the frontal cortex, particularly in the third layer, looked emptier than usual. It was interesting to see that the orbital region had suffered more than the region of the convexity. The damage was slighter than that of the dorso-medial nucleus, and this might reflect upon the relative strength of the thalamic pathways. Apparently the thalamo-frontal pathways which resulted in the degeneration of the dorso-medial nucleus were much stronger than the other fibres, and so if the route of the operation was correct this might be a tragic observation, because it showed that the human brain had made provision for the human race to present instinctual drives to the prefrontal structures, but not given adequate means for the prefrontal cortex to control them. He thought there was a definite lesion, but he had not mentioned it in his paper, not because of lack of time, but because the point needed further investigation before anything was published.

Dr. Cook asked whether the different cases had been operated on by the same surgeon. Different surgeons were concerned, and some of the operations belonged to an earlier experimental period. Technique as a whole had improved, but it was Mr. McKissock himself who said that even with improved technique there would always be vicissitudes of completeness of the operation and the placing of the cut.

Dr. Pickworth asked about the unmyelinated fibres. In fact, Freeman and Watts did not find a degeneration of thalamo-frontal fibres, and that it was slight in the thalamal fibres pointed to the fact that many of them were unmyelinated or had only a poor myelination. He did not think this of necessity involved visceral change. It was known from observations made in Professor Le Gros Clark's laboratory that the connections between the caudate nucleus and the premotor area, and the so-called suppressor band of area 4, were largely unmyelinated. Apparently many more fibres were unmyelinated, and a decision would have to be made as to the significance of their functions.

With regard to Dr. Brody's remarks, recovery might occur without damage anywhere in the brain, and this had been demonstrated in one of his cases and also by Freeman and Watts and Goodman in depressive patients who had tried to kill themselves and to inflict brain injuries to themselves. He thought one should not forget that the place where the cut was made was the soundest as far as a knowledge of personality, organization of emotion and emotional expression went.

With regard to the question of the electrical or other destruction of the dorso-medial nucleus, the answer had been given by Mr. Clark-Maxwell. He, personally, thought that the operation in this region would be major and larger in surgical intervention and less safe than the cutting of the thalamo-frontal fibres. He had put the dorso-medial nucleus into the foreground because he wished to take it as a test for the destruction of the thalamo-frontal fibres, but it must not be forgotten there might be other factors such as the cingulate cortex to which Freeman and

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Watts attributed so much significance. So far he had not seen any degeneration in the cingulate cortex, but these tracts were obscure in their pathology and physiology, and this applied to other tracts. So far it had been difficult, or even impossible, to find any degeneration, but these things had to be looked for, and a successful operation on the dorso-medial nucleus might mean that an important point was missed. Professor Golla had attempted to devise an electrical leucotomy which had not materialized beyond the experimental stage.

With regard to vitamin deficiency he mentioned that pellagra was the cause of death in one case, and thiamine deficiency was the cause of death in another. It was worth keeping in mind that in the post-operative phase the nutritional aspect was of some importance.

Dr. Brody asked about visceral change. The dorso-medial nucleus acted not only with the prefrontal cortex but with the hypothalamus particularly; its magno-cellular part was in direct communication with the hypothalamus. Recently Walker had pointed out that the magno-cellular part participated in the projection to the frontal cortex, and this would mean an almost direct pathway connecting the hypothalamus in a double way with the prefrontal cortex, which would, of course, explain the visceral change observed. Freeman and Watts found the magno-cellular portion intact in their cases; he found that all had suffered, though not to an equal degree to the parvicellular part of the dorso-medial nucleus. Whether this was of some significance to recovery or not he did not know. It was one of the points which he had in mind which would have to be ascertained in a larger material.

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PSYCHOPATHIC PERSONALITY AND CRIME.

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Discussion.

Psychiatric research has elucidated many unrecognized facts, and added much to our knowledge of the causes of criminal behaviour in mentally abnormal persons. At the same time the fluidity of modern psychiatry, itself evidence of progress, makes it difficult always to present simply and clearly modern views in a court of law.

This is particularly the case in matters concerning the non-sane, non-insane aberrant individuals known as psychopathic personalities in many classifications, as constitutional psychopathic inferiors by some writers, as neurotic characters by Zilboorg, as abnormal personalities by Healy, and whose abnormalities are referred to by the Army authorities of the United States of America as constitutional psychopathic states, and by Henderson as psychopathic states. It is my purpose to consider their association with criminal behaviour.

The criminal law requires facts to be ascertained, and their relation to the offender as well as to society to be understood. When individual or group behaviour assails social order and security it becomes necessary to interpret it in terms of motive and intent. In modern terminology we endeavour to determine its motivation.

In this matter confusion is likely to result if the statements of accused persons are accepted without criticism or question; if attested facts, which clearly show the motive and intent of the accused at the time the offence was committed, are disregarded; if excuses for criminal behaviour are unnecessarily based upon assumptions of unconscious motivation; and if the offender's ability to deal with his instinctive urges in a lawful manner is distorted by unwarranted suppositions.

Although it is true that a careful medical investigation into the mental condition of an offender is required when the motivation of a crime is obscure, it is also true that in the majority of cases there is no obscurity, and sometimes it may be harmful to the offender as well as to society to explain illegal behaviour by a remote hypothesis.

The motivation of mentally normal and subnormal offenders is usually apparent to an informed and experienced observer. Obscurity is generally due to the fact that relevant information is purposely withheld from him. In mental deficiency, psychopathic personality, psychoneurosis or psychosis the motivation is often only disclosed as the result of a psychiatric investigation.

No special difficulty arises in differentiating psychopathic personalities who commit crimes from normal or subnormal persons, psychoneurotics or psychotics. Uncertainty regarding the boundaries of mental defectiveness and psychopathic personality, and the fact that the constitutional element is significant in both, appear sometimes to confuse their essential differences. And there can be little doubt that the forensic study of psychopathic personalities has been delayed through exaggerations regarding the frequency and importance of mental defectiveness in relation to crime.

Moreover, a distinction is equally important in civil life. It would surely outrage the public conscience if such persons as Joan of Arc, Napoleon and Lawrence of Arabia, listed as psychopathic personalities by Henderson and Gillespie, as well as other psychopathic personalities known to many of us, were proclaimed mentally defective persons and permanently detained in certified or state institutions for defectives. Let it be also remembered that mental defectiveness is incurable, and the assertion " once defective always defective " is still axiomatic.

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The Joint Committee on Mental Deficiency of the Board of Control and of the Board of Education reported in 1929 that the diagnosis of mental deficiency may be established without a full history from the data observed by the medical examiner, but it can never be firmly sustained, however much it may be suspected on the evidence of history alone. This statement loses much of its accuracy when applied to psychopathic personalities, in whom a detailed, accurate and complete history may be much more valuable than a personal examination. Indeed, an experienced observer cannot live long in daily contact with a mentally defective person without becoming aware of his abnormality, but one may be on close terms with a psychopathic personality and have no knowledge of his disability.

Further, although Tredgold states that no niche can be found for the mentally defective person in which he can live without supervision, it is a matter of common knowledge that many psychopathic personalities order their lives usefully and successfully.

The observer who fails to differentiate between mental defectiveness and psychopathic personality appears to have no place for persons whose ethical abnormality arises from disease after the age of eighteen unless they are mentally subnormal, psychoneurotic or psychotic, and therefore has no reason to offer which would carry weight in modifying the award in a criminal court in favour of the accused. But the psychopathic personality is well endowed intellectually as a rule, and there is reason to believe that treatment sometimes socializes his character and behaviour, when these are antisocial, to an extent which is advantageous to himself as well as to others.

No one who is constantly occupied with problems connected with the psychiatric aspects of crime can be satisfied with a position which fails to discriminate between mental defectiveness and psychopathic personality. From the clinical, medico-legal, therapeutic and research points of view this discrimination is essential for progress in the domain of forensic psychiatry.

Frequency.

The number of psychopathic personalities in the civil population is unknown, since many never reach the psychiatrist's consulting-room, and pass through life with their mental abnormality undeclared and unrecorded by their associates.

Savitt reports that during the fifteen years 1920–1934 the average distribution of psychosis with psychopathic personality among first admissions from New York City to all institutions for mental diseases in New York State was only 2·17 per cent. At Creedmoor State Hospital during the fiscal year 1937–1938, the total number of patients admitted and diagnosed as psychosis with psychopathic personality was only 2·1 per cent. of all admissions during that year. But, as Savitt points out, only the small minority of psychopaths who have psychotic episodes reach a mental hospital, and his figures throw little light upon the number of psychopathic personalities in the civil population.

Constitutional psychopathic state headed the list of principal psychiatric disorders in the American Army hospitals in 1938, and occupied second place to mental defectiveness in 600 neuro-psychiatric cases at a United States of America Naval Training Centre. Curran, in 1942, found that 5 per cent. of the cases admitted to Royal Naval Hospitals and Sick Quarters in Great Britain with neuro-psychiatric disorders were diagnosed psychopathic personality. Eliot Slater, in the same year, found, in a study of 2,000 neurotic soldiers in an E.M.S. Neurosis Centre, that 265 were diagnosed psychopathic personality, but the group " included all patients in whom there was held to be a constitutional abnormality of personality of fairly severe degree, mainly responsible for any neurotic symptoms or failure of adaptation. The abnormality might be of any type, and included, for instance, cyclothymics, long-standing hysterics, the severely and chronically anxious, as well as those usually included under this head."

Of 130 ex-service patients treated at the Royal Edinburgh Hospital for Mental and Nervous Disorders from the beginning of the war to the autumn of 1943, Stalker found 45 suffering from psychopathic states as described by Henderson.

Estimates of the number of psychopathic personalities who commit crime vary with the concepts and personal bias of the assessor, and with the emphasis attached to the psychopathic syndrome. Different observers tend to give widely different

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estimates, just as still happens in regard to the association of mental defectiveness and crime.

The difficulty of assessing the proportion of psychopathic personalities in the criminal population becomes evident when the literature dealing with the condition is reviewed apart from its relation to criminal behaviour. The various groups are sometimes so ill-defined as to appear all-inclusive, but delimitation is necessary if we are to make clinical distinctions in a court of law with some degree of precision.

In a series of 4,000 juvenile delinquents Healy and Bronner found that 2·8 per cent. were psychopathic personalities, and they state: "We firmly stand against the diagnosis of psychopathic personality made simply on the basis of repeated misconduct without other signs of psychopathic trends—there are too many other causations of misconduct." I may add that prison experience in England and Wales gives full support to this view.

Dealing with psychopathic personality H. S. Hulbert declares: "The delinquent is rarely psychopathic." Kraines, on the other hand, expresses the view that:—"These persons are ill, just as the psychotic patient; and the habitual criminal is a socially sick person who may have a recoverable or incurable illness, the true nature of which can be determined by proper investigation." The habitual criminal in England, however, is often a person who has deliberately chosen crime as a career, and may show none of the criteria considered necessary before a diagnosis of psychopathic personality or other mental abnormality can be made.

Prewer, in 1944, found that of 1,000 naval offenders received into Naval Detention Quarters, 87 were psychopathic personalities, and he excluded from this number 15 schizoid and 2 cycloid personalities. Service offences, however, for the most part, differ from crimes in civil life, and we have at the present time no data to show how many offenders are received into civil prisons whose crimes are associated with psychopathic personality disabilities.

Limitations.

For practical purposes the mental conditions of delinquents and criminals are conveniently classified into six main groups: Normal, subnormal, mentally defective, psychopathic personality, psychoneurotic and psychotic. But the clinical picture is not always as clear as this statement might suggest, since the groups often overlap. For example, a psychopathic episode may occur in a mentally defective, psychoneurotic or psychotic patient, and a psychopathic personality may develop a psychoneurosis or psychosis.

In 1834 Prichard described moral insanity in a letter to Dr. Tuke as—"The mental state of persons who betray no lesion of understanding or want of power of reasoning and conversing correctly upon any subject whatever, and whose disease consists in a perverted state of the feelings, temper, inclinations, habit and conduct. Such individuals are sometimes unusually excited and boisterous; and others dejected (without any hallucinations), sometimes misanthropic and morose." In modern times the term "moral insanity" is translated "psychopathic personality," and important additions to the literature on the subject have been made by Partridge, Kahn, Schneider, Cheney, North, Levine, Petrie, Slater and many others.

In his Salmon Memorial Lectures Henderson emphasized the importance and place in psychiatry of the psychopathic personality, and stimulated interest in the clinical types. He also outlined principles for their social rehabilitation. He described them as "individuals who conform to a certain intellectual standard sometimes high, sometimes approaching the realm of defect, but yet not amounting to it, who throughout their lives, or from a comparatively early age, have exhibited disorders of conduct of an antisocial or asocial nature, usually of a recurrent or episodic type, which in many instances have proved difficult to influence by methods of social, penal and medical care and treatment, and for whom we have no adequate provision of a preventive or curative nature. The inadequacy or deviation or failure to adjust to ordinary social life is not a mere wilfulness or badness which can be threatened or thrashed out of the individual so involved, but constitutes a true illness for which we have no specific explanation." Elsewhere, Henderson states: "The life histories of these patients teach us that we are dealing with persons who from a tender age, and out of a variety of causes, have proved a problem

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to themselves as well as to the world at large, people who psychobiologically have remained at an immature, individualistic, egocentric level, who are determined to get their own way irrespective of the cost, who fail to grow up to any sense of reality, and are so changeable and fickle that they lack persistence of effort and are unable to profit by experience. Their emotional development and their judgment and forethought have not kept pace with their ideational component. Their conduct throughout life has been punctuated by disturbing episodes which have given rise to great anxiety. Their higher inhibitory control mechanisms are in abeyance, and they are dominated entirely by their emotional instincts."

Curran and Guttmann, discussing the social significance of psychopathic personality, maintain the view that—" Psychopathic personalities as such cannot be regarded as medical problems, although they are very prone to develop abnormal reactions which would bring them into the medical domain. The possession of an abnormal character leads to difficulty in adjustment in normal social life, and therefore such personalities frequently show up as petty criminals, vagabonds, prostitutes. It would, however, be quite wrong to assume that all abnormal characters are of a socially undesirable kind. . . . Psychopathic reactions are characterized by their transient, episodic, and often explosive character, and by their reactivity to environmental factors. The storm may be very violent whilst it lasts, and may take the most diverse forms—loss of temper, impulsive conduct, fits of depression and uncontrolled weeping, suicidal attempts, fugues—but it is usually soon over, although it may be readily provoked again."

The psychopathic personality usually appears in the criminal courts as a non-sane, non-insane individualistic and discordant person. He may be of subnormal, normal or supernormal intelligence. Sometimes he presents evidence of exceptional ability, and this may be seen in several directions. Whether possessed of subnormal, normal or supernormal intelligence, effective output is often impeded by the fact that the necessary effort is ill-timed and ill-considered. Judgment is often biased, and action explosive as well as variable. The psychopathic personality is frequently incapable of making satisfactory social adjustments in particular directions because of transient and episodic anomalies of character, emotion, moral sense or sexual make-up. He is, for the most part, unable to put himself in the position of others, and consider the issue from their point of view or act accordingly. He fails to appreciate the fact that in human relations a common measure of thought and action is often indispensable. He may be tolerated within his own circle because there is a good deal of class loyalty in different grades of society, but in the constructive work of the world contacts must be made without as well as within a special group. He often fails because in modern society each one of us depends to some extent upon others for our personal comfort and well-being. Consequently we resent unreliability when we have a right to expect effective assistance, we refuse to tolerate aggression and injustice, and we are affronted by the selfishness of the egocentric if it violates the welfare of others and runs counter to accepted social prohibitions. It is characteristic of the different types of psychopathic personalities that they are unable to subordinate a short-term gratification to a long-term advantage. Many are unable to make a sustained effort of a particular pattern, to profit by experience and learn the restraining influence of reality. Some have insight into their condition. The impressive self-criticism of T. E. Lawrence, in spite of its beauty of expression, makes painful reading : " I began to wonder if all established reputations were founded like mine, on fraud . . . the praise-wages of my acting had now to be accepted. . . . With men I had a sense always of being out of depth. . . . There was a craving to be famous ; and a horror of being known to like being known. . . . To put my hand on a living thing was defilement. . . . I had a longing for the absolutism of women and animals. Many things I had picked up, dallied with, regarded, and laid down for the conviction of doing was not in me. . . . I was a standing court-martial on myself . . . the truth was I did not like the ' myself ' I could see and hear."

These are not the words of a happy man. They are recalled here in order to accentuate the fact that even the supernormal psychopathic personality may be unable to overcome his constitutional disabilities, and to show that his range of usefulness is restricted if his responses to stimuli are ruled by perverse urges and inhibitions. They also point to the fact that in our judgment of the psychopathic

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personality we must consider, as in other cases of mental abnormality, not only an activity or series of activities, but their motivation.

Elsewhere I have described the criminal psychopathic personality tentatively, from the medico-legal aspect, as a person who, although not mentally defective, psychoneurotic or insane, is persistently unable to adapt himself to social requirements on account of abnormal peculiarities of impulse, temperament and character, which may require specialized medical and rehabilitative treatment, instead of, or in addition to, the ordinary methods of punishment, before his social reclamation is effected.

Omnibus descriptions are open to the criticism that they widely embrace different types, whereas only certain features of each are common to others. Curran and Mallinson head a recent valuable survey of the literature of psychopathic personality with the apt quotation: "I can't define an elephant, but I know one when I see one." And Kenneth Walker's reference to the story called "The Disagreement as to the Description and Shape of the Elephant," in which those who handle one in the darkness only understand it in respect of the part they touch. is not without significance for those who study this group.

Many of the cases seem to lie in the borderland between mental disease and anomalies of character rather than between mental disease and mental health. The *Oxford English Dictionary* defines disease as absence of ease. Horder says: "A disease is the sum of all those recognizable changes which result from the disturbance of the state of equilibrium which, being serviceable to the individual, we term "Health." Ryle defines a disease as "the whole consequence of a conflict between man (or animal) and the noxious agencies in his environment." He points out that the patient, the pathologist, the physician and the surgeon interpret the term differently, and he quotes Sydenham's observation: "A disease, in my opinion, how prejudicial soever its causes may be to the body, is not more than a vigorous effort of nature to throw off the morbific matter, and thus recover the patient." It seems clear that many psychopathic personalities judged by these standards cannot be regarded as suffering from disease. For their particular reactions often represent the man himself rather than the effect upon him of "noxious agencies" and "morbific matter."

The conception of character as the growing modifiable and self-regulating part of the personality is even more elusive. It covers the volitional and inhibitory phases of behaviour, and is the driving force which, to a large extent, is dependent upon intelligence and temperament. Shand describes the "Stages of Character" under three headings, which he says "roughly correspond to the three levels of mental development: (1) the instinctive, (2) the emotional, (3) the level of sentiment; and again roughly these three are represented in (1) the life of the animal, (2) the life of the child, and (3) the life of the adult human being. The first is the most perfect in organization; but also the most rigid, in which intelligence has least formative influence. The second is the most helpless, and marks the transition from a lower to a higher form of organization for which the guidance of the adult mind is indispensable. The third is the most plastic and comprehensive, but its organization is never completed. In it reflection, reason and self-control have their full opportunities; yet it is the region of folly and error, with which we can hardly charge the animals; of mistaken valuations followed by disillusions; of progress and decadence; of constancy and infidelity. It has never been understood."

The development of character is progressive, and for the most part advances more or less gradually. It is reasonable to believe that in some psychopathic personalities the advance ceases somewhere between the second and third levels of mental development mentioned by Shand, or in the lower levels of the third. In other cases it would seem that from various causes regression from a normal level of development to a lower has occurred.

Causation.

The study of psychopathic personality stresses the importance of the constitutional factor if the aberrant behaviour cannot be traced to conflict, and is inconsistent with the particular or general situation under consideration—but in some cases the psychopathic activity appears to be related to early fixation, and in others to later psychical conditioning.

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Moore thinks of constitutional psychopathic conditions as mild forms of insanity, and Partridge writes: "As compared with some of the other mental deviations, the class of psychopathic reactions may be said hardly to have arrived in psychopathology."

Bleuler considers that: "We have here to deal with deviations from the normal in all possible directions and mixtures." If this comprehensive view is accepted, it would seem to demand an authoritative decision delimiting the standards of normal conduct. Often, standards of behaviour are said to be outside the range of normality because they extend beyond the assessor's personal experience, which may be quite limited in certain directions although extensive in others. And this very fact may lend an artificial air of authority to his pronouncements, just as when the hand of the Hindu fell on the trunk of the elephant in the dark and caused him to say, "This creature is like a water-pipe."

Slater calls attention to the fact that "with few exceptions the psychopathic personality is the result of a combination of hereditarily determined tendencies. which in other combinations might have led to normality or even to a superior type of personality." He stresses the fact that "character must be determined by many thousands of different genes, and it is difficult to isolate the fact in any one."

The study of psychopathic personality is very far from completion, and it would seem that we have not passed the stage when the scientific approach to the problem should be as simple as possible if it is to be constructive. Genetic and other studies therefore will be valuable only in so far as they relate to cases in which the diagnostic criteria are faithfully attested. It may be that here, as elsewhere, the general medical practitioner who studies different generations of the families he attends can contribute much to our knowledge. For he can study the effects of social and antisocial traits of character as they pass from the parents to their descendants.

Humphreys accepts the view that psychopathic personality, like mental defectiveness, represents arrest in development, especially mental development associated with social inadequacy. Chornyak writes: "Egocentricity is a normal stage early in childhood of personal maturation . . . this type of psychopathic personality is fixed at this early egocentric level because of damage to the most recently acquired areas in the cerebrum." Earl D. Bond suggests that the term egocentric psychopath may be more appropriately changed to idcentric psychopath on the assumption that there has been a lack of development either of the ego or superego. Sprague would seem to agree with Partridge. In discussing the psychopathology of psychopathic personality he states: "There has not been reported any structural pathology which would offer a somatic or neuro-pathological foundation for psychopathy. Hence we must consider it as a functional abnormality, a behavioural deviation from what is customary."

Binder analysed 350 cases of illegitimate pregnancy from material supplied by the municipal social agency of the city of Basle. One third were normal, one-sixth oligophrenic, and one-half psychopathic. Henderson stresses the importance in such cases of emotional conflicts and insecure living conditions in leading up to conduct disorders of the antisocial type. In 34 illegitimate persons under observation Henderson found 50 per cent. presented the picture of a psychopathic state.

If the clue to character is related to early memories, which in some cases become essential factors in the creation of aberrant behaviour, it seems clear that an innate factor must be present also, since the same memory arising at the same time in a sibling of a near age may have no untoward result. And since the different types of psychopathic personality differ so much from one another, the endogenous and exogenous causative factors may perhaps be most profitably studied in types rather than in the group as a whole.

Discussing abnormal characters Curran and Guttmann write: "It is perhaps worth mentioning that bodily anomalies frequently co-exist with the psychological anomalies in these abnormal characters, and all the so-called nervous symptoms, such as tremors, restlessness, profuse sweating, vasomotor lability with blushing and fainting and an allergic disposition are frequently found combined with the psychopathic anomalies, though detailed correlations have yet to be made. The same is true as regards morphological anomalies, often called stigmata, asthenic build, disproportion in physique, under-development of the secondary sexual characters or heterosexual features."

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It is well to bear in mind, as Curran and Mallinson point out, that all abnormal characters do not in fact develop abnormal mental reactions: "The possession of an abnormal character does not in itself constitute a medical problem unless of course it is most illegitimately so defined." They also point out that "to equate psychopathic personality with abnormal character . . . approximates perilously to making the study of psychopathic personality co-extensive with the major part of psychiatry."

A practical view will accept the fact that neurological, bio-chemical, and psychological changes as well as inherited and more general environmental factors may so alter behaviour as to render the individual incapable of social adaptation.

Goltz's classical experiment, in which he induced a condition of "sham rage" in a dog by removing a large part of the thalamus, and the hypersensitivity to aggressive stimuli which is a feature of the thalamic syndrome in man are significant. Best and Taylor refer to the suggestion that certain conditions in man, for example, the manifestation of fear in cases formerly described as "shell-shock," the unreasoning rage in some cases of drunkenness, and the emotional instability of certain mental disorders associated with degenerative changes in the cortex, may be due to the release of the hypothalamus from cortical control. Le Gros Clark, discussing the relation of the functions of the frontal cortex and hypothalamus, refers to Elliot Smith's description of the former as the seat of the higher mental faculties, and he states elsewhere that the prefrontal areas may be regarded as "a final product of cerebral development where the activities of the purely cortical mechanisms underlying the intellectual components of personality are equated with the activities of the hypothalamic region which are associated with the more fundamental and primitive components." Cox refers to cases which show that lesions removed from the cortex may cause profound alterations in conduct, whilst Alpers in a recent study of the literature discusses personality and emotional disorders associated with hypothalamic lesions which were related to antisocial behaviour.

The pathological findings in cases of encephalitis lethargica, and the effects of the disease upon personality and behaviour rendering the latter at times indistinguishable from the antisocial activities of certain psychopathic personalities, are well known. So too, the occasional result of accidental as well as operational injury to the brain on conduct. I have elsewhere described a case that would now be classified as psychopathic personality in which a young man received an injury to the head in the War of 1914–1918. Shortly afterwards his character changed and his career was marked by deceit, lies, thefts, extravagances and callous selfishness. A pulsating area due to trephining to relieve pressure on the brain was present over the left Rolandic area, together with paresis on the right side of the face, wasting of the right arm, weakness of the right hand, and an alteration of speech. The physical signs were clearly the result of damage to the brain, and it was reasonable to attribute the coincidental character changes to the same cause.

The criminologist, however, cannot disregard the fact that injury and disease may produce a pathological condition of the brain without evidence of psychosis or psychopathic personality. He must also consider the socializing effect on some psychotics of the modern operation of prefrontal leucotomy, and the significant fact that the static view of the central nervous system is undergoing modification. Golla has recently stated: "It seems as though the central nervous system can reorientate itself. If it cannot work in one way it will do so in another. . . . If there is dysfunction in one part another will take on its function."

Ingham considers that from the neurological aspect, constitutional psychopathic inferiority implies a failure in some important adjustment to environment largely due to innate constitutional conditions; and that this implies variation from the normal in the arrangement of the inherent structural patterns of the brain. He says: "To-day it is generally conceded that, in the last analysis, all thought and all behaviour are the results of physical and chemical reactions in living tissues."

Having regard to the similarity between the EEG's of aggressive psychopaths and those of young children, Hill and Watterson suggest that "cortical immaturity" is a factor in the causation of this type of psychopathic personality. They also consider that on the evidence gathered by them from control material and patients, as on that obtained by other workers, one can have no doubt that an abnormal EEG constitutes a handicap for its possessor in the matter of biological adaptation.

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failure of which may result in emotional behaviour. It is interesting to note that in a group of 75 criminal psychopaths Silverman found 80 per cent. revealed abnormal or borderline abnormal EEG tracings.

A longitudinal section of the behaviour of elderly psychopathic personalities supports the view that ageing may assist in directing aberrant behaviour along socially acceptable lines. The fact that the values of life change with the years seems to be related to physiological as well as psychological influence, and the researches of various workers in physiological pathogenesis are stimulating. Such, for example, as the work of Broster and his colleagues on the adrenal cortex and intersexuality, the induction of alkalosis by means of hyperpnoea with resulting epileptic seizures by Lennox and others, and the observations of Hill and others on the effect of hyperventilation, hydration and hypoglycaemia in cases of " dysrhythmic aggressive behaviour."

The " experimental neurosis " induced in dogs by Pavlov as a result of the " clashing of excitation with inhibition " aroused in the differentiation of visual stimuli, and in sheep by Anderson and Liddell in the differentiation of auditory stimuli, are perhaps not without significance for the criminologist who wishes to take a wide view of the disorders of conduct. For the term " criminal habit " used in Acts of Parliament, in the law courts, in official documents and discussions, as well as by psychiatrists, sociologists, and others, denotes a very real phenomenon. And Pavlov's statement that " the different kinds of habit based on training, education, and discipline of any sort are nothing but a long chain of conditioned reflexes " is especially noteworthy when considering recidivism. Nevertheless, in the study of the neurological, bio-chemical and psychological causes of behaviour a facile and illogical tendency to argue from the particular to the general must be avoided.

Whether, as I incline to believe, the subject of psychopathic personality should be first studied in regard to the different types, or whether, as Curran and Mallinson suggest, its structure can be most appropriately approached by using the term in a wide sense, there will be general agreement that the causation of the aberrant behaviour of the psychopathic personality offers scope for much-needed research in many directions.

Classification.

Different authors have suggested various classifications of the many groups of psychopathic personalities, and the differentiation from psychoneurosis is not always clearly defined. This is particularly unfortunate in medico-legal situations, since dubious and widely comprehensive statements in a court of law add to the uncertainties connected with an already obscure subject, and to the insecurity of the syndromes of psychiatry.

The American Psychiatric Association classifies psychopathic personality : With pathologic sexuality—indicate symptomatic manifestations, e.g. homosexuality, erotomania, sexual perversions, sexual immaturity. With pathologic emotionality —indicate symptomatic manifestations, e.g. schizoid personality, cyclothymic personality, paranoid personality, emotional instability. With a social or amoral trends—indicate symptomatic manifestations, e.g. antisociality, pathological mendacity, moral deficiency, vagabondage, misanthropy.

Healy presents four groups : the unstable egocentric personality, the constitutional inferior personality, the idiosyncratic personality, the psychotoid personality. Henderson refers to the predominantly aggressive, the predominantly passive or inadequate, and the predominantly creative.

The above, together with the classifications of Kraepelin, Partridge, Kahn, Schneider, Strecker and Ebaugh, Sadler, Bleuler and others have in common the fact that they all recognize the condition as essentially a disorder of social conduct. Normal conduct, however, is a theoretical postulation, and the injunctions and prohibitions of to-day will not necessarily be our standards and guides to-morrow.

From the medico-legal point of view psychopathic personality is associated with particular considerations, and the benefits to society which owe their origins to the aberrations of state builders, writers, musicians and others must be taken into account when estimating the harm inflicted by some psychopathic personalities. It may be misleading to limit the academic connotation of the term to overt

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deviation of behaviour, since there can be no doubt that some homosexual psychopathic personalities, for example, lead irreproachable lives, and the activities in other groups are not necessarily antisocial unless a very wide use of the word is accepted.

The classifications of some authorities support the view of White that psychopathic personalities occupy a place between the criminal and the insane. Nevertheless, even when conduct is grossly aberrant it may not be criminal. For example, de Saussure, in 1929, described the case of a pervert aged about thirty who had been married for seven years, and whose sexuality was fully satisfied by standing on his head and remaining in this position for thirty seconds. Other gross sexual perversions of a non-criminal nature, including coprophilia and solitary elaborately constructed sado-masochistic practices, are probably known to many of us who are field-workers as well as students.

I have suggested the following clinico-descriptive classification as useful in criminal cases: Psychic inferior personalities; aggressive egocentric personalities; ethical aberrant personalities; alcohol and drug addicts; sexual perverts; schizoid, cycloid and paranoid personalities. This classification, like many others, includes the sexual perverts. Henderson and Gillespie in their well-known text-book describe sexual aberrations among the psychoneurotic reaction types. In a later study Henderson refers to sexual offenders under the heading of psychopathic constitution. J. R. Rees refers to sexual perversions under the heading of psychoneurotic delinquency, and Hubert and East refer to the not infrequent association of sexual offences and psychoneuroses.

Perhaps the difference is largely a matter of emphasis. In psychoneurotic crime stress is laid on conflict, and the resulting reaction of the patient; in psychopathic personality on constitution, and the action which is normal to the individual.

I have excluded from the classification so-called kleptomania and pyromania because genuine examples of these conditions are, in my experience, uncommon; and when unconnected with the affective and schizophrenic or organic reaction types of disorder, or mental defectiveness, seem more appropriately considered among the epileptics, hysterics and compulsive-obsessive states. Some are malingerers. Dealing with hysteria in another connection, Anderson doubts whether it is entirely justifiable in all cases to include in the groups of hysterical characters pathological liars, swindlers, writers of anonymous letters and others. I would add that a similar doubt arises also when some of these offenders are included in the psychopathic personality group.

Differentiation.

Discussions on the clinical varieties of psychopathic personality must accept the fact that one type often overlaps another, and just as the symptoms of many diseases are seldom present at the same time in any one patient, and an adequate description of an illness must usually present a composite picture of the symptoms in several cases, so, too, a composite picture is often required to feature a particular type of psychopathic personality.

Psychic inferior personality.—In any community certain individuals stand out from their fellows because their characters and personalities are above the average. Others frequently, or constantly, demonstrate their inferiority in both particulars. When they are heavily loaded with inferiority, which markedly affects their social adjustments adversely, they may be regarded as psychic inferior personalities only if the disability is persistent. For no man can hope to be at his best at all times; anxiety, fatigue or physical illness may temporarily alter his reactivity and reduce his efficiency, but as soon as these are removed the normal man returns to his normal level of behaviour.

In many cases the condition appears to be essentially constitutional in origin, but at times the environmental factor seems to be of particular significance. If, for example, the head of a family holds strong patriarchal views and also enforces them with assertive zeal, he may secure obedience in the home and forfeit the growth of independent self-reliance in his children. The modern parent, perhaps wiser in his generation, usually cultivates a relationship with his children which encourages their affection and comradeship, and leads to a steady development of self-confidence which flourishes by the restraint, wisdom and experience of the parent

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directing the enthusiasms, desires and energies of the child. Nevertheless, psychic inferiority may result when both parents and environment appear to be favourable, and it would seem that in these cases certain factors which contribute to the inferiority have been transmitted to the children through the parents acting as carriers.

Psychic inferiors are often good-natured and likeable people, facile, placid and sociable. But they lack will-power and resourcefulness, and avoid making decisions. Hence they are incapable of successful improvization, and follow the line of least resistance. They avoid responsibility, and are unable to deal with situations which require persistent effort. They readily form antisocial habits, and lack the force of character which enables the ordinary man to overcome the everyday difficulties of life. They are suggestible and often ill-advised in selecting their friends and acquaintances. Their emotional activity, for the most part, is blunted, and they are more willing as a rule to receive than to give. They may be, however, useful citizens within their individual limitations. They may be successful in married life if their partners are of the dominant type, able and willing to protect and guide them, and ready to accept the ever-present duty of shielding them from the vicissitudes of life. But if death, or a temporary difficulty or separation leaves the psychic inferior to face responsibility alone, he soon fails to maintain the social security to which he has been accustomed under the shelter of his lost companion since he is essentially a parasite. Indeed, if it be true, as a modern writer* has declared, that in general we make the voyage of our lives by dead reckoning, it is also usually true that the psychic inferior personality is unable to steer a true course alone, even though he be assisted by the most modern equipment.

If criminal conduct is exhibited it may be markedly aggressive; murder and suicide may result. But usually the crimes committed are minor in character, and petty thefts, embezzlements, and the lesser forms of fraud as well as the less aggressive varieties of sexual offences are frequent accompaniments.

Since the characteristic features of this type of personality are negative, and positive qualities are necessary for satisfactory social adjustment, it is not surprising that many psychic inferiors become recidivists. Their conduct in prison is related to their negative attributes. They are usually quiet, orderly, industrious, prudent, contented and well-meaning. They gain some measure of emotional discipline in the orderly routine life of prison. But the good intentions, which for a brief space actuate their social relationships on leaving prison, soon succumb to the stresses and hazards of life in the outer world, and they return to prison for offences which, on the whole, are more a nuisance than a menace to social security. Their incurability is not surprising since their character is founded upon an insecure basis, which prevents them from making the adjustments necessary for success in a complex modern world. Nevertheless, a measure of adjustment can sometimes be attained if appropriate modifications of the environment are assured.

This was a noticeable fact in the War of 1914–1918, when recidivists belonging to the psychic inferior group were absorbed into the Forces, and often surprised those of us who knew them by the manner in which they satisfied the authorities in the performance of their duties under the supervision of an understanding senior, and with the support they obtained from identification with the unit in which they served. At the same time the outcome of enlistment in the Fighting Services during wartime is unpredictable, since it depends upon the unknown stresses which may arise in future situations. Undoubtedly a proportion of those taken into the Fighting Services become liabilities.

The following cases illustrate types of social inadequacy in this group:

Male, aged 26: *Attempted suicide.*—There was no family history of mental disorder. His father was an aggressive, domineering person who frequently thrashed him, and his cruelty to the boy was known to the neighbours. His brothers looked down upon him as a weakling, and there was a doubt in his mind as to his legitimacy. His mother was killed in a motor accident when he was aged eighteen, and her death deprived him of her support in all his difficulties as well as of her affection. He was on good terms with his sister. He left school in Standard VII and obtained work in a factory, but after a year his father transferred him to a colliery so as to earn better wages. Later, a month at sea was followed by enlistment in the Army during peacetime. He was unable to accommodate himself to the life, and made three

* R. B. Cunninghame Graham.

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attempts at suicide in order to obtain his discharge when he was upset by trivial occurrences. After 15 months' service he returned to civil life and obtained different employments, sometimes retaining them for a few months, at other times only for a few days. At the time of his arrest on the present charge he had made six other attempts at suicide, and had received two short sentences of imprisonment on different occasions for these offences. He had also served a short sentence for false pretences. The attempts at suicide were not accompanied by the histrionic features which Gillespie so aptly associates with the hysterical personality. They were not related to manic-depressive disorder, but they were responses to situations which an ordinary person would overcome without difficulty. He was rather above the average in intelligence, but was conspicuously inferior in his manner of life and method of dealing with life's problems. He was unable to establish friendships, but enjoyed outdoor amusements which were free from responsibility. His sexual interests were normal, and he had a love affair which ended when he suspected the girl of being friendly with another man. Observation over a period confirmed the diagnosis of psychic inferiority, and showed the importance of adjusting his life, as far as possible, to the inadequacies of his personality. The hope that he might attain a limited degree of success was encouraged by the fact that his physique and general health were good.

The following case was seen with Surg. Lt.-Cmdr. G. Tooth, R.N.V.R.:

Male, aged 38: *Naval offence.*—This rating stated that his father was intemperate and that his sister was in a mental hospital. He was sent to an Industrial School for theft and remained there until he was 16 years of age. He then went to sea for nine months, and since then has had many occupations for short periods only. He joined the Navy during the World War, but finding the life distasteful attempted suicide and also deserted in order to obtain his discharge. He had not served overseas and was never in action. He had been convicted in the civil courts nine times between the years 1924 to 1942 for wilful damage, loitering, being on enclosed premises and theft. He was untruthful in a purposeful manner and alleged, unsuccessfully, that his thefts were due to an impulse which he could not control. He read popular works on psychology, and used the information to excuse his civil and naval offences. He was alert and intelligent, but he was unreliable and lacked will-power. He was suggestible, and based his conduct on short term aims. He was unable to accept the ordinary difficulties and responsibilities of life, and desired to take all and give nothing in return. His emotional tone was blunted. He married a widow, but soon left her, and was unconcerned when she went to live with another man. He was inclined to boast of his civil and naval offences. He was solitary and without ambition; he was satisfied with his inadequacy because he failed to appreciate it. He worked well in prison and was well behaved. He found there the security and freedom from the difficulties of life against which he was unable to contend in the outside world. His health and physique were good. He was a psychic inferior with slight schizoid trends, and his future seemed likely to be unsatisfactory to society. It by no means follows that it will appear unsatisfactory to him. Indeed, if the years bring him parasitic ease he is likely to be content, although he remains in a backwater all his life.

Incorrigibility was persistent in the following case (previously recorded in the *Report on the Psychological Treatment of Crime*, East and Hubert).

Male, aged 74: *Rogue and vagabond.*—The family history showed no factors of medical importance. A brother had been in prison. His father was a respectable bricklayer and both parents were teetotallers. He was apprenticed to a trade, but found picking pockets as one of a gang more profitable, and at the age of 17 was sentenced to five years' penal servitude for frequenting the crowd at the entrance to Sadlers Wells Theatre and stealing a gentleman's watch. Eleven previous convictions were proved against him at the time, and although it may be thought that his future criminal career was determined by the long sentence imposed upon him, it seems likely that a criminal habit had been already formed. In addition to nine summary convictions as a suspected person, 43 offences were recorded between the years 1882 and 1937 for theft, suspected person, rogue and vagabond, attempted theft, and once for assaulting the police. For these offences he received sentences of imprisonment totalling 179 months, and terms of penal servitude amounting to 25 years. He had also been bound over on four other occasions.

He was well preserved physically and mentally. His health was good, and there was no evidence to suggest that he had at any time suffered from any mental disorder. He was alert, intelligent, quiet, sensible in conversation, and a rather likeable old man. He never married, but kept in touch with his relations, and they welcomed him to their homes when he was discharged from prison. He lived for the moment and was unable to take the long view. He was a wishful thinker who refused to acknowledge the realities of life, and was without ambition. He experienced little satisfaction when his crimes succeeded and little disappointment when they failed. He was not hostile to the society which had taken from him so much liberty, and never rebelled against the mischances of life. He was industrious and well-behaved in prison and had become institutionalized to some extent. He was a nuisance, but not a menace to society, and if his qualities of character had been less negative might have directed his life towards useful citizenship.

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Psychic inferiority was associated with manic-depressive disorder which culminated in murder in the following :

Male, aged 45 : *Murder (two charges) and attempted murder.*—His father was dead, but he remained in contact with his mother and siblings. No mental disorder in the family was admitted. He was a single man, and a near relative considered that he had never been able to stand alone. On leaving school he was employed at a newspaper office and was then apprenticed to a baker. and followed that employment for six years. During the war of 1914 to 1918 he served in France, and on demobilization obtained work as a labourer, and later was employed on night duty at an institution for about five years. Between 1925 and 1943 he remained at one occupation for two years, at another for a few months, and left both of his own accord. The greater part of these years was spent in prison. He served sentences varying from 18 months to 1 month for 30 offences : 14 were for wilful damage, others for false pretences, theft, fraud, being on enclosed premises, loitering, and twice for attempting to commit suicide. They were all trivial and might be regarded as indications of social inadequacy, and none were for violence against others. He was of average intelligence, but lacked the power to will or make sustained effort. He persistently followed the line of least resistance, and was unable to deal with the ordinary difficulties of life satisfactorily. The desire of the moment actuated his decisions, and he disregarded long-term advantages if they were opposed to short-term gains. He was unable to profit by experience or adjust himself to the realities of life. His emotional reaction—apart from manic-depressive periods—was blunted ; he was unable to make friends, and was unconcerned with his numerous sentences of imprisonment.

In later years his relatives became disturbed by the alteration in his character, and apprehensive at his occasional outbursts of excitement. Between 1933 and 1940 he made five attempts at suicide, and was twice certified as insane whilst serving sentences in prison. He was transferred to a mental hospital and was looked upon as a case of manic-depressive disorder.

He called at a lodging-house occupied by a widow and asked for accommodation. As he was being shown a room he demanded money from the woman, and when refused grasped her by the throat and said " I've got to kill you." She gave him some money and became unconscious. He then left her. Three days later he knocked at the door of another apartment house in the same district and throttled the landlady with his hands. He stole the money in her handbag and left her dead. Three weeks later he gained admittance to another apartment house in the same district, and killed the landlady by strangling her with a shoe-lace. Although this murder was also committed for gain he took nothing from the house. Two days later he gave himself up to the police and gave them a clear account of the crimes. Whilst awaiting trial the experienced prison medical officer found him elated, querulous, and aggressive. If crossed in any way he was at once resentful. He was suspicious, argumentative, and quite indifferent regarding the moral aspect of his crimes, which he freely admitted. He expressed no remorse for his victims. He was considered to be insane by the prison medical officer, but he did not come within the McNaghten ruling and the jury refused to accept the defence of insanity. At an after-trial inquiry into his mental condition he was certified to be insane and was transferred to Broadmoor Criminal Lunatic Asylum.

Aggressive egocentric personality.—Crimes committed by this type of psychopathic personality are often a danger to society, as well as to the offender. The aggressive egocentric, like the young child, is over concerned about himself and resents the restraint which others impose upon his capricious self-indulgence and narcissistic outlook. He is not merely selfish, but also assertive, wayward, irritable, impulsive and unreliable. He lacks self-discipline, and makes little or no effort to control his instinctive urges in a reasonable manner. His unbounded self-confidence, conceit and exaggerated self-regard antagonize many of his associates. He is critical of others, but as a rule is uncritical of himself; he is difficult to persuade, as he believes himself to be the most important star in his particular constellation. He refuses to compromise in difficult situations, and meets opposition with impulsive and often violent behaviour. His general pattern of response is characterized by emotional tension, and he is often unscrupulous in his dealings with others. His egocentricity limits his ability to concentrate on matters which are unrelated to himself, but if his interests lie in idealisms, his true personality may not be apparent to those who are inexperienced in the unscrupulousness which is sometimes exhibited by the thwarted idealist.

Although the aggressive egocentric psychopath has confidence in his ability to meet difficult situations, he fails to recognize the difficulties which his intolerance creates in his relations with his associates. His ready acceptance of responsibility is an attribute of his aggressiveness, but it seems to be due, to some extent, to his inability to appreciate the chances of failure, and until this occurs he may be envied by his companions.

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Crimes committed by offenders of this group range from murder to assaults, attempted suicide and sexual offences; drunkenness and violence to property as well as motor offences are frequently associated with the condition. The offender's reaction to imprisonment varies. Many, aided by the discipline and routine of the institution, control themselves and work well. Others are uncertain, aggressive, impulsive, undisciplined, explosive and unreliable. Occasionally a prison paranoia results.

The successful, aggressive, self-confident egocentric is not included in this group of abnormal personalities. It is not merely a question of degree which here separates the normal from the abnormal, but the fact that emotional instability and an inability to profit by experience make the conduct of the aggressive egocentric psychopathic personality incalculable, unreliable and often dangerous. The qualities which require firm guidance if success is to be attained are uncontrolled, and act injuriously to the man himself as well as to society.

Male, aged 45: *Throwing corrosive fluid with intent.*—No reliable information concerning the family history was available. The prisoner had not suffered from any serious illness. There was no reliable history of his childhood. As an adult he soon came to be regarded by the police as a danger to society, a blackmailer and a bully. He first came to their notice at the age of 21, and was sentenced to two months' imprisonment as a suspected person, loitering. Later he was convicted of burglary and received a sentence of nine months' imprisonment. Still later he was bound over for malicious wounding; he struck a man over the head causing a wound which required six sutures. After this he was convicted of firing a pistol at a man at point blank range whilst playing cards because he had lost some money; he received a sentence of nine months' imprisonment. On completing this sentence he was convicted of receiving a motor car knowing it to be stolen, and was sentenced to twelve months' imprisonment. In the following year he was sentenced to ten years' penal servitude for throwing corrosive fluid over a woman with whom he had cohabited, and soon afterwards was sentenced to nine years' penal servitude for wounding an official with intent to do him grievous bodily harm. During his imprisonment he threatened the staff as well as his fellow prisoners, and violently assaulted the latter on two occasions. His general health was good. He was alert, intelligent, and showed no evidence of idiopathic epilepsy, psychoneurosis or psychosis. His explosive outbursts were excessive responses to situations which would not have produced a trigger-like reaction in a normal person. His egocentricity was marked. He was selfish, conceited, assertive, irritable, explosive, quarrelsome, and without thought for the feelings of others. He declared that he preferred to deal personally with anyone who he thought had wronged him. He was boastful and untruthful. After a prolonged medical interview on one occasion, and perhaps because of it, his conduct remained satisfactory for some months, but the improvement was not maintained, and further episodic explosions occurred. He remained unable to profit by experience, and short-term aims regained their ascendancy over long-term advantages. He was so satisfied with himself that it seemed unlikely that he would be able permanently to adjust himself to social requirements.

It is recognized, of course, that successful aggression feeds on its victims. The bully reinforces his aggressiveness at their expense. This phenomenon is so common that it cannot be considered abnormal. Indeed, in his distorted way the bully profits by experience. This man, however, over a long period received disciplinary awards for his violent misconduct in prison. He was unaffected because of his inability to profit by the past, and this, together with the facts recorded in his history, brought him within the group of unstable egocentric abnormal personalities.

A climax was reached at the beginning of manhood in the following case:

Male, aged 26: *Murder.*—The homicide came from a respectable home; both parents were alive, and his father had been employed by one firm for 20 years. Two brothers older than himself were married, a younger sister was unmarried, and another was dead. No mental abnormality was recorded in the family history. The prisoner left school in Standard VII, and was transferred to a central school and reached the highest class. On leaving school he obtained employment at a good wage, but left at the age of 17 after a quarrel with his father. He then enlisted in the army but disliked the life, and his father obtained his discharge. After a period in civil employment he rejoined the Army but was discharged on medical grounds. At the age of 18 he deserted a girl who had become pregnant by him. He went out with another girl, and soon afterwards attempted to strangle a third girl who made disparaging remarks about her. After leaving the girl unconscious he gave himself up to the police, and as a result was sentenced to detention in a Borstal institution for three years. He had previously been convicted of theft. During this sentence he boasted about his wanton acts; he was arrogant, conceited, and callous, but well behaved. On his release from the Borstal institution he married the girl he had attacked. Subsequently he was convicted and sentenced to periods of imprisonment for

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stealing a cycle, stealing a motor car, and for robbery. He attempted suicide twice, and served a short sentence of imprisonment for one attempt. His wife made ample provision for him when he left prison after the robbery, but he gave way to violence and spent his time drinking with different women. At the time of the murder he was wanted by the police for bilking a taxi-driver. When his wife was out he broke open the gas-meter and stole the contents, and having strangled their child with his wife's stocking left home. He spent the money drinking with women, and when it was exhausted gave himself up to the police. He appeared to have been fond of the child, and the motive for the crime was undisclosed and could be only assumed. There was no reason to think that he was under the influence of drink at the time. The death sentence was commuted to penal servitude for life.

There was no evidence of psychoneurotic or psychotic disorder. He was mentally alert, and above the average in intelligence. He was impulsive, irritable, aggressive and selfish. Apart from the effect of drinking, the explosive violence to himself and others, which temporarily relieved the rising emotional tension of the moment, was so opposed to his long-term interests and so ungoverned by experience that it was evident an exaggerated response was produced by slight episodic impacts. At the same time the long period of controlled behaviour in the Borstal institution was misleading when an attempt was made to estimate the usefulness of his future career.

It is important to differentiate the above types of offenders from the criminal whose aggressiveness and violence form part of his stock-in-trade :

Male, aged 37 : *Possessing firearms to endanger life.*—He was a married man with several children, but at the time of his present crime had not lived with his wife for a considerable period. He had been previously convicted for thefts, and on two occasions had been discharged on his own recognizances for these offences. On the third occasion he was sentenced to three years' detention in a Borstal institution. This was followed by a short sentence for loitering, and subsequently of penal servitude for robbery with violence. He was working with a gang of criminals and knocked a man down in the street and robbed him of £300. On the present occasion he was concerned with others in a Post Office robbery, and when arrested tried to get at a loaded revolver he was carrying in order to shoot the police and escape. At the Borstal institution he was found to be intelligent, alert and energetic. He was quick-tempered, but was able to control himself. He placed too high a value upon his capacity, and over-estimated his importance in the labour market. He was found employment by the authorities on discharge from Borstal which would have led to steady advancement, but he exchanged it for other work which was better paid and only temporary. He wrote from the Borstal institution : " I can stick to anything when my inclination lies that way, not for honesty's sake, but because it suited me better. . . . As I had urgent need of money at that time I turned to the only means I had of obtaining it in any quantity. So I took the situation laughing up my sleeve, as it were, at the people who thought I would work for such paltry wages. During that time I was still engaged thieving to make up what I considered a living . . ." This statement expressed much of his outlook on life. He was a clever mechanic and could have earned good wages, but he was vain and unscrupulous and had chosen a criminal career determined to enjoy the profits. He was callous and selfish, untruthful and brutal. His crimes were not the result of psychoneurosis or psychosis, but were committed with a full realization of the chances he took. He could control himself when he wished to do so. His violence was not the trigger-like response of the unstable aggressive egocentric psychopathic personality, but the cool, determined aggression of the calculating terrorist. It was not surprising that when his conceit was vanquished in prison and he found terrorism availed him nothing, distortion occurred, and a mild prison paranoia resulted.

Ethical aberrant personality.—The essential character features in this group are an unusual forcefulness of several instinctive urges, an exaggerated emotional instability, an abnormal deficiency of will-power, together with a lack of ethical understanding and an inability to profit by experience, so great that in spite of normal or superior intelligence the individual is a danger to society and sometimes to himself.

Under the heading of Constitutional Ethical Aberrations, Bleuler includes " enemies of society, antisocial beings, moral oligophrenics, moral idiots and imbeciles. Moral insanity." But the factors which produce antisocial behaviour and crime are so complex that it is important, from the medico-legal and research points of view, to restrict the grouping of mentally abnormal criminals to the generally accepted syndromes of psychiatry. It will often be found very difficult to consider that an enemy to society or an antisocial person is, by that fact alone, an abnormal person in the ordinary use of the word.

Moral sentiments are gradually acquired, and their growth depends upon the teaching, practice, code and custom accepted by parents, sibs, teachers and associates. Many enemies of society and antisocial persons as well as criminals are

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such as the result of faulty instruction and training. Their unlawful activities arise from environmental conditions and mental conflicts which can often be traced to their origin without difficulty. Others, from a variety of causes, select crime as a career. But in many ethical aberrant personalities environmental conditions are entirely favourable as far as can be judged, and no conflict can be attested as the cause of their criminality.

Burt, like many others, is dissatisfied with the term moral defectiveness, and as an alternative suggests temperamental defectiveness. Henderson and Gillespie, and some others, now use the term psychopathic state or psychopathic personality for this group.

Their numbers are small, and as I have already stated, the ethical aberrations sometimes arise as the result of a mentally disabling illness affecting the patient after he has reached the age of eighteen, and therefore excluding him from the moral defective group. The mental abnormality appears to be similar, and may be expressed in the same way as in the cases which occur earlier in life. They may be considered as examples of moral insanity, but from the medico-legal and research points of view are usually conveniently included, as here, among the ethical aberrant personalities.

The clinical criteria of this group are so well known that only a brief reference to them is required. As I have said, the intelligence may be normal or supernormal. Excitability, instability, irritability, quarrelsomeness, spitefulness, cruelty and destructiveness are usual features. Acquisitiveness, aggressiveness and sexuality predominate and may be uncontrolled. Priority of self against all others, a callous indifference to the rights and feelings of others, and an absence of affection accompanied by lack of forethought or wisdom, together with a permanent inability to appreciate the importance of reality and the value of communal rights and conventions, are distinguishing criteria. Although emotional regard for others is absent, strong uncontrolled emotional displays in situations which oppose the egocentric desires of the individual are frequently exhibited.

A lack of ethical understanding does not of itself constitute this psychopathic condition. Indeed, the ethical aberrant personality may display verbal morality in his discriminating replies to ethical perception tests, but he fails in their practical application to situations which concern himself. And since the offences result from the exaggerated activities of many instincts in the same individual, the criminal record is seldom restricted to one class of offence, as so often happens in the case of the habitual criminal. Some pathological liars and pathological swindlers belong to this group.

The crimes committed by the ethical aberrant personality include murder, attempted murder, assaults, arson, rape, indecency, theft, fraud, embezzlement, damage to property, and the like. They are usually committed for an inadequate purpose, and are distinguished by a lack of concealment and disregard for the results. An almost constant indication of the condition is the fact that the associates of the ethical aberrant personality recognize that his conduct is unusual and that he cannot be relied upon. So it comes about that he commits crime alone.

Discussing the occasional effect of brain injury on conduct in the section on causation above I have briefly alluded to a case in this group. Other examples are described in some detail in my book on *Forsenic Psychiatry* under the headings of " Moral Imbecility " and " Moral Insanity."

A recent case is the following :

Male, aged 42 : *Murder.*—There was no record of mental abnormality in the family history. From an early age this homicide was a thief and a liar, often for no apparent reason. At the age of 16 his father refused to let him live at home as his conduct was intolerable. There was no reliable information regarding his occupations in earlier years, but he appears to have never had any settled employment. He was a clever designer, but was unable to apply his conspicuous talents with any degree of regularity, and his behaviour was so erratic that his career was marked by an occasional success which was followed by a series of failures. He married an estimable lady for her money and position ; he had no sexual interest in women, and flagrantly practised homosexuality before and after marriage in a manner which was intended to hurt his wife's feelings. For the greater period of their married life they lived apart, but he persuaded her to become a Roman Catholic in order to prevent her from divorcing him. He frequently quarrelled with her, and used the most profane and obscene expressions to emphasize

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his hostility. He ordered valuable presents to be sent to her as a peace-offering and to regain her favour, but he left her to pay for the article. Over a period of years he obtained very large sums of money from her, but his enterprises consistently failed, and in these and other directions gross extravagances were only paid for by the generosity of his wife. In spite of her constant kindness and consideration he circulated scandalous and wholly untrue statements about her. He also made outrageous statements about important people who had incurred his displeasure. On one occasion he was bound over at the police court for an assault on a man, and on another occasion for using threats. He was suspected of having wantonly killed a valuable dog he owned. He threatened to kill himself because a young homosexual accomplice became interested in a woman. He sent his wife a letter on black-edged paper saying he was about to commit suicide, and followed this up with further threats to do so. At this time he came under the notice of a psychiatrist who made a diagnosis of moral defectiveness, and he was admitted into a mental hospital, but he shortly afterwards escaped and did not return.

He strangled a youth who was his homosexual partner at the time, and the next morning the maid on entering the room found him in bed asleep with the corpse by his side. He then locked himself in and turned on the gas-fire without lighting it, and when the room was forcibly entered was found lying by the fire more or less unconscious. His career was punctuated with revolting homosexual experiences, deceit, lies, frauds, cruelty, aggressiveness, and a complete disregard for the rights and feelings of others and of social prohibitions in general. He was a teetotaller, and was not a drug addict. His abnormal conduct was persistently callous and unexplained by the immediate situation. He did not consider the probable consequences of his indulgences and had no remorse for his conduct, but there was no lack of ordinary intelligence. The details of his vicious and criminal activities fill very many pages, which confirm the diagnosis of moral defectiveness, or ethical aberrant personality. He refused to allow a defence of insanity to be raised at his trial, and was sentenced to death. As the result of an after-trial enquiry into his mental condition he was transferred to Broadmoor. The diagnosis was independent of the homosexuality of the patient, except that in this feature, as in the rest of his conduct, wanton selfishness and callousness were outstanding.

It is clear that there are several factors common to the aggressive egocentric personality and the ethical aberrant personality as outlined above. They may perhaps with some fitness be looked upon as subgroups of an idiosyncratic personality group. But the classification adopted in this article is intended to bring into prominence the fact that in criminal cases aggressiveness is the dominant feature in the one, and lack of morality in the other. It seems that this distinction is useful in present-day studies of psychopathic personalities and crime.

Alcohol addicts.—Discussions on alcohol addiction have been, perhaps, more adversely affected by bias than most other debates on social problems. MacCurdy's statement that " the alcoholist is before he ever touches a drop an abnormal person " expresses only a partial truth for those who doubt whether anyone is normal. Trotter's dictum that " In the tragic conflict between what he has been taught to desire and what he is allowed to get, man has found in alcohol as he has found in certain other drugs a sinister but effective peacemaker, or means of receiving for however short a time some way out of the prison house of reality back to the Golden Age " eloquently declares a psychological fact. But it is not universally applicable if we accept the view that some alcohol addicts drink although they are unencumbered by disagreeable experiences or unpleasant thoughts. For although alcohol provides a method of escape for some, it also furnishes others who are carefree with an added pleasure, and it is an interesting fact that in classical antiquity convivial excess appears to have been frequent among the most prosperous sections of society.

Some persons seem to take alcohol in order to raise their affective tone to normality, and others to raise it from normality to a euphoric level. The former blindly search for emotional ease, the latter less blindly and less excusably for unusual pleasures.

The alcohol addict may be defined as a person with some insight who is unable to forego his habit, or maintain a reduction of his intake to an innocuous amount, in spite of the fact that he is causing injury to himself and others by his indulgence. Before deciding that he is a psychopathic personality, appropriate emphasis must be given to his mental constitution. For it must be remembered that indulgence in alcohol may be a symptom of other mental disorder ; particularly in criminal cases, when it is often associated with manic-depressive disease, general paresis, the psychoneuroses, high-grade mental defectiveness or epilepsy. Some alcohol addicts seem to arrive at that state as the result of habit alone. I have already referred to the fact that the psychic inferior personality is frequently an

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habitual criminal, and there seems to be little doubt that some alcohol addicts belong to the psychic inferior group because of the ease with which they form certain habits if they lack the positive qualities of mind required to resist them. But it is important to study the individual in this matter rather than generalizations. The middle-aged man who has hitherto led a normal life, and then indulges in alcohol in order to escape from domestic and business anxieties when his mental and physical abilities are beginning to decline, may be suffering from fatigue, anxiety, reactive depression or other mental disability, but is not likely to be included in this group of psychopathic personalities if he has previously been abstemious.

In the absence of psychosis, psychoneurosis, mental defectiveness, or evidence of psychic inferiority, it may be considered that the alcohol addict belongs to a special type of psychopathic personality if his addiction cannot be traced to a relevant cause other than an apparently inherent inability to make social adjustments without its assistance ; if it arises before or during the early years of maturity; if it persists although the addict is aware of the injury he is causing himself and others by his inability to forego a transient psychomotor stimulus and euphoric effective tone ; and if he is unable to order his life on a long term basis in this matter.

The release from morbid inhibitions which alcohol produces may seem to be advantageous. The removal of shyness, for example, resulting in an easy sociability lends an attractive feeling of power to the addict, and seems desirable to him in spite of the manner by which it is attained. In everyday life we see the transition from seclusive introversion to companionable extraversion by the aid of alcohol. But it is also common knowledge that the release from morbid inhibitions effected by alcohol has an adverse result and gives rise to antisocial behaviour. Thus, in cases of constitutional or acquired homosexuality overt activity may be inhibited by social and ethical considerations, but is likely to be expressed if the higher controls are narcotized by alcohol. Similarly with exhibitionism, sadism and masochism. The picture may be complicated by the aphrodisiac action of the drug, but the matter is mentioned as it exemplifies the manner in which one type of psychopathic personality sometimes overlaps and influences another.

The path of the lawyer and administrator, as well as of the diagnostician and therapist, will be easier when we know more about the predominating factors associated with alcohol addiction. The view that it is attributable to inheritable influences leaves some inquirers dissatisfied. Perhaps part of the answer is at present hidden in the unsolved actions of chemical substances upon the human organism. And perhaps modern research is narrowing the field of exploration as it narrows the pathological conditions directly ascribed to alcohol as a poison. Thus, the distinguished members of the Alcohol Committee set up under the Medical Research Council refer to the modern work of Wechsler, Minot and his colleagues as well as of Joliffe and others, which indicates that the so-called alcoholic peripheral neuritis is not due to alcohol itself, but to the failure of the diet of the alcohol addict to contain amounts of the vitamin B complex. The statement of Caldwell and Hardwick in their survey of neuropsychiatric studies in vitamin B deficiency that " recent work strongly suggests that some mental disease is produced by a lack of these accessory food factors " may be shown by future research to be significant here also.

Psychopathic personalities of this group, like other consumers of alcohol in excess, may commit almost any offence. Homicide and other crimes of violence are particularly frequent. No offence is pathognomonic of the condition, but periodicity and the commission of similar activities on repeated occasions may suggest its psychopathology if manic-depressive disease, epilepsy, obsessive and menstrual mental aberrations are excluded. The general characteristics of the alcoholic psychopathic personality are well known and need not be repeated here. It may be noted, however, that on reception into prison symptoms of deprivation may appear in the form of irritability, depression, insubordination, aggressiveness and hostility. If persistent they generally denote a significant degree of mental deterioration.

Drug addicts.—Adams divides drug addicts into four main classes:

1. *Stabilized addicts*, who never exceed a certain, usually, small quantity which is, as a rule, employed for its stimulant effects. They are, to all appearance, normal useful persons bearing none of the ordinary stigmata of addiction.

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2. *Accidental addicts*, who have acquired the habit through legitimate medical treatment, or through want of caution in the administration on the part of doctor or nurse, or through self treatment for some painful ailment, or who, without any positive evil in their nature, have drifted into indulgence through bad example or bad surroundings.

3. *Natural addicts*, people of inadequate personality, drawn from the type of persons variously termed " psychopathic " or " psychoneurotic " or " mentally unstable." They are peculiarly liable to become addicted if circumstances are favourable.

4. *Criminal addicts*, who use drugs in search of new sensations, or to fortify themselves for a life of crime or for depraved motives, such as the search for aphrodisiacs.

Adams points out that not all are agreed whether a cure should be attempted in the first class. Many in the second class desire to be cured and often are cured by judicious treatment. A large number in the third class have no real wish to be cured, and in all cure is difficult and relapses common. In the criminal addict cure is almost hopeless.

More generally, drug addicts may be studied according to their use of narcotic and non-narcotic drugs. The addictions of the latter do not usually lead to criminal behaviour. Narcotic drug addicts may be divided into those who use, for example, morphine and its derivatives to ease physical and mental pain, or cocaine for its pleasurable effects, and those who use barbiturates for their hypnotic effect and often when there is no real insomnia. The number of drug addicts in this country who commit crime as a result is insignificant.

In all cases of morphine and cocaine addiction a character change, directly attributable to the use of the drug, sets in so quickly that an addict may commit crime early in his addict career. Whether all those who take these drugs habitually to their own disadvantage and that of others, and cannot permanently abstain, belong to the psychic inferior group or to a special group of psychopathic personalities, is, perhaps, doubtful. But in a wide view of psychopathic personality associated with crime it seems desirable to consider them in a special setting.

The Mayor of New York's Committee on Drug Addiction in 1931 found that of 318 males treated—the majority using heroin, and the remainder, except a very few cocainists, being morphinists—50 per cent. were constitutional psychopaths, and the majority of the remainder were criminals, vagrants, paranoid personalities or homosexuals.

Sexual perverts.—A true sexual perversion may be described as a persistently indulged sexual activity in which complete satisfaction is sought and obtained without the necessity of heterosexual intercourse. Slater found in the group of 265 psychopathic personalities to which I have already referred, and which included a wider range of persons than is accepted in this article, that an inhibited sex life was especially frequent. He found a similar result in 137 mentally defective persons in the same investigation. Slater observes that this inhibition " is clearly a quality of deep biological significance, and it may be that it is genetically associated with factors that make for inferiority of intelligence and temperament." I would add that in many sexual perverts coming before the criminal courts sexual inferiority is a noticeable feature.

Sexual perversions associated with criminal behaviour were considered in a Report by Hubert and myself in 1939, and more recently by me elsewhere. It will suffice to recall here the fact that exhibitionism is the most frequent perversion seen in the criminal courts, homosexuality, paedophilia and sadism less frequently, and fetishism as well as transvestism infrequently. I have personal experience of only three cases of necrophilia and one of pygmalionism associated with crime. Bestiality is usually a crime of convenience.

Schizoid, cycloid and paranoid personality.—Attention may be drawn to these types of mental constitution if they show marked social maladjustment in their daily lives. The solitary, shy, retiring schizoid given to day-dreaming and taking little interest in the external affairs of life may declare himself by his eccentricity and unsociability; the cycloid, at times elated and at times depressed, by the clashing of his mood swings with the activities of his companions; the suspicious asocial paranoid by his biased interpretation of the intentions of others, which canalizes his thoughts and limits his conduct to provocative responses. They are

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frequently seen of course in ordinary civil life, and need no special consideration here.

If they commit crime and are examined in cross section whilst awaiting trial their mental condition may resemble early schizophrenia, manic-depressive disorder or paranoia, but after sentence further observation will show the unprogressive nature of their disability. Although a crime may appear to have little connection with the mental aberration of these offenders, it is important to remember that their personal difficulties in civil life may become exaggerated in the ordinary prison surroundings if these are unadapted to individual requirements.

Treatment.

Psychopathic personalities present particularly difficult problems to lawyers, administrators and psychiatrists. We cannot expect those who are responsible for social security to be greatly interested in the subject so long as offenders who are a little unusual are classed together without any differentiation. I believe that until our knowledge of the subject is greater we can study the criminal psychopathic offender best through the clinical types set out here.

Generally surveyed, the psychopathic personality belongs to the non-sane, non-insane group of offenders, and the penalties usually applied to others who are sane or insane are often unsuited to them. Some differ so little from the normal that any special medical recommendation to the court would affront the offender and disturb the public conscience. A few are so abnormal that they must be regarded as legally insane in their own interests and those of society. The majority of cases lie somewhere between the two extremes, and present varying degrees of culpability. The question whether medical treatment or punishment, or a combination of the two, should be administered can only be determined by the judicial authority after the facts in each case have been carefully reviewed. I believe that a sentence of imprisonment adds force to psychological treatment in some cases, and assists in adjusting the psychopathic personality to his environment. If the special penal institution to which I presently refer is established, experimentation can be also made in the adjustment of the environment to the psychopathic offender.

The significance of the constitutional factor of the psychopathic personality has discouraged therapy, and an enthusiastic advocacy of psychological treatment must be avoided until results on a sufficient scale of well-attested cases are published. The many conditions met with in psychopathic personalities are peculiarly resistant to treatment. O'Mally states psychoanalysis as a therapeutic measure seldom produces here satisfactory results. North considers that the prognosis is more favourable when serious manifestations of psychopathic behaviour do not arise before adolescence. Levine believes that the psychopathic personality is often more difficult to treat than the neurotic, because the difficulties of the former often have a large element of pleasure connected with them which he is unwilling to forego. Silverman holds the view that treatment of psychopaths along psychotherapeutic lines has not been fruitful. Probably all those who have long experience of these varieties of offenders will largely agree with these findings.

Perhaps the constitutional factor is sometimes over-emphasized. In another connection Aubrey Lewis points out that constitution is the more or less stable product of the interaction of heredity and environment whilst the organism is developing. And perhaps Glover had something of this in mind when he said that there is a considerable difference between analysing a drug addict and analysing a drug addiction. The clinical fact remains that in many cases treatment must be directed toward the long and difficult task of amending the character of the offender rather than the speedy dissipation of a collection of acquired symptoms.

Preventive treatment is all important, and the earlier its application the better will be the effect. To ensure this end medical men require training in mental hygiene, and it should not be difficult for them to appreciate when a case should be examined by a psychiatrist. The provision of more psychiatric units and out-patient clinics will facilitate both the in-patient and out-patient treatment of psychopathic personalities.

The Criminal Justice Bill, 1938, indicated the direction of official thought in the modern treatment of crime, but it cannot be denied that in this country public

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opinion lags far behind, and for the most part is uninterested in the subject. It is beginning to bestir itself in some directions, and post-war planning should impress the fact that although society must be protected from the criminal, he, too, must be protected from himself as well as from society.

The prevention of crime and the treatment of the individual offender is a problem of social science as well as of penology. It is sometimes suggested that the psychiatric approach to crime provides a sentimental excuse for wrongdoing, and that the credulous acceptance of psychiatric opinion subverts the principles of moral integrity and social security. This view is encouraged by the great variety of personal traits which are sometimes put forward as evidence of mental abnormality, but which seem to be no more than the ordinary variations of character we find from time to time in ordinary persons.

Medical and supervisory treatment during probation from the court, or short sentences of imprisonment, often fail. And although a short sentence may be an appropriate award for an offence committed by a psychopathic personality, it is often inappropriate for the reclamation of the offender and useless as a punishment. It should therefore receive little approval from an informed public. We are here concerned with one of the most difficult problems associated with mental abnormality and crime. It is far from solution. Modern psychiatry is, however, dynamic, and new methods of investigation and treatment are being introduced. When accepted methods fail the remedy lies in awarding a substantial period of detention in a special institution established on lines somewhere between a prison and a mental hospital, as proposed by East and Hubert. Such an institution administered on colony lines by the Prison Commissioners would protect the public from major as well as minor crimes, and enable the psychopathic personality to be studied closely, and the possibilities of his re-education and reclamation to be explored.

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DELIRIOUS DISORIENTATION: THE LAW OF THE UNFAMILIAR MISTAKEN FOR THE FAMILIAR.

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PSYCHIATRY made a great advance when it began to recognize the psychological meaning of mental symptoms—when it took the stand that it is not enough to establish that a patient has, say, delusions, but that one must relate the content of the delusions to the patient's life experience. Another stride has yet to be made, and that is the recognition of the *physiological* meaning of symptoms. Mental activity being the manifestation of cerebral activity, mental aberration must signify some aberration in the function of the brain, however normal this organ may appear to the eye. In a case of mental disorder, therefore, just as much as in hemiplegia, one must inquire how the laws of physiology reveal themselves in the signs and symptoms of the disease. To return to the example, it is not enough to show that the content of a delusion represents the patient's thoughts and strivings, but there remains the question: What has happened to his brain to cause his thoughts and strivings to assume the guise of delusions, when in a normal man they merely take the form of fancies? When a deluded patient says he is a very rich man, a certain psychological cause is at work. A healthy man, too, may be worried about money, but, in response to this cause, he merely *fancies* himself a rich man. The demonstration of a psychological cause, therefore, does not explain the sick man's delusion. All it explains is the *content* of the delusion; since the patient is worried about money, his delusion deals with wealth rather than some other topic. But it does not explain *why* the patient has delusions. The explanation of this must lie in some cerebral defect which permits inferior modes of thought to occur in response to certain situations. Psychiatry will not reach its full stature as a science until it regards each mentally sick person and each of his symptoms as a problem in cerebral physiology.

Disorientation is a symptom which lends itself particularly to physiological study. This paper deals with the tendency of delirious patients to mistake the unfamiliar for the familiar, a tendency which Hughlings Jackson mentioned in illustration of the principle of "reduction to a more automatic condition." Incidentally it will be shown that this tendency distinguishes the disorientation of delirium from that of other psychoses, such as schizophrenia.

JACKSON'S VIEWS ON DEGREES OF AUTOMATIC ACTION.

Jackson, conceiving of the central nervous system as a series of levels, said that the lowest levels are the oldest, the least complex, the most highly organized and the most automatic, while the highest levels are the newest, the most complex, the least highly organized and the least automatic. The growing child may be used in illustration. When a child is learning to walk, his first steps are laboured and require his full attention. With time and practice the nervous pathways involved become firmly organized into a stable mechanism which functions with a high degree of dependability, and now the child can walk even when he has his mind on something else; walking has become automatic, and is carried on by lower well-organized centres, while the highest centres are otherwise occupied. Within the highest cerebral centres, too (the centres whose activity manifests itself, among other things, in mentation), there are mechanisms which may become automatic. Certain mental operations are so simple that they require for their performance

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only the lowest " layers " of the highest centres, and after a little practice they become relatively automatic. Thus when one is about to say " Good morning " to a friend, one seldom thinks of the words to be said, but says them automatically.

It must be remembered that " layers," as used here, signifies physiological rather than morphological layers. Least of all does it signify the cellular layers of the cortex.

The crux of this discussion lies in the proposition that a stimulus which normally activates the highest layers of the highest cerebral centres (producing a complex response) will, if those layers are paralysed, be able to activate only the layers next below (producing an inferior response). Consider, for example, an epileptic who is at the moment in a transitory clouded state following a *petit mal* ; approach him in this state and he is likely to attack you ; approach him when he has recovered and he will greet you civilly. The *petit mal* has temporarily knocked out his highest layers, so that they cannot be activated ; instead, inferior layers are activated. Jackson applied to this phenomenon the term " reduction to a more automatic condition "—a term cumbersome but accurately descriptive. His papers abound in illustrations drawn from cases of mental disorder, aphasia, epilepsy, hemiplegia and other disorders of the most varied nature. Indeed the demonstration that many important phenomena are the manifestations of action of intact lower centres acting in lieu of paralysed higher centres may be regarded as one of Jackson's major achievements.

Disorientation in Delirium.

It is fortunate for the purpose of this paper that Jackson specifically considered the problem of delirious disorientation, using as an example the delirious man who mistakes the nurse for his wife. Two quotations will be given, the first dealing with delirious disorientation in general, the second more specifically with the mistaking of nurse for wife.

In the Croonian Lectures (*Selected Writings*, ii, 50) (1) Jackson said :

" The (delirious) patient's condition is partly negative and partly positive. Negatively, he ceases to know that he is in hospital, and ceases to recognize persons about him. . . . The negative mental state signifies, on the physical side, exhaustion, or loss of function somehow caused, of some highest nervous arrangements of his highest centres. We may say conveniently that it shows loss of function of the topmost ' layer ' of his highest centres. No one, of course, believes that the highest centres, or any other centres, are in layers ; but the supposition will simplify exposition. The other half of his condition is positive. Besides his not knowings, there are his wrong knowings. He imagines himself to be home or at work, and acts, as far as practicable, as if he were. Ceasing to recognize his nurse as a nurse, he takes her to be his wife. This, the positive part of his condition, shows activity of the second layer of his highest centres, but which, now that the normal topmost layer is out of function, is the then highest layer. His delirium is the ' survival of the fittest states ' on his then evolutionary level. Plainly he is reduced to a more automatic condition."

In his paper " On Affections of Speech from Disease of the Brain " (*ibid.*, ii, 168) (1) he said :

" In simple cases of delirum . . . as when a patient takes his nurse to be his wife, we find, I think, a going down to and a revelation of what would have been when he was sane the lower and earlier step towards his true recognition or perception of the nurse.

" The first step towards his recognition of her when he was sane would be the unconscious, or subconscious, and automatic reproduction of his, or one of his, well-organized symbol-images of woman ; the one most or much organized in him would be his wife. To say what a thing is, is to say what it is like ; he would not have known the nurse even as a woman, unless he had already an organized image of at least one woman. The popular notion is, that by a sort of faculty of perception, he would recognize her without a prior stage in which, he being passive, an organized image was roused in him by the mere presence of the nurse. . . . We seem to ourselves to perceive, as also to will and to remember, without prior stages, because these prior stages are unconscious or subconscious. It seems to me that in delirium the patient is reduced to conditions which are revelations of, or

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parts of, the lower earlier and prior stages; the lower or earlier stages are then conscious. They are the *then* highest or latest conscious states. When the patient becomes delirious, he takes the nurse to be his wife. More or fewer of the highest nervous arrangements being then exhausted, the final stage is not possible; there is only the first stage; the reproduction of his well-organized symbol-image is all there is, and that is all the nurse can be to him; she is, to him, his wife."

It is possible that Jackson's explanation will not be easily understood, and the matter deserves further elaboration. Each object one sees excites a pattern of neurones characteristic of that object. Each woman one beholds excites in one's brain a characteristic neural pattern. If this were not true—if two or more women excited the same pattern—they would be visually indistinguishable. When a woman is beheld again and again, the pattern becomes, from repeated arousal, more and more firmly organized. This is in keeping with the neural changes that may be assumed to underlie the learning process. Repetition of a movement or of an association (such as that of an object and the word which represents it) strengthens the " links " which bind the neurones involved, so that in time the movement or association becomes automatic. When one has used a foreign word a hundred times one knows it better—it springs to mind more automatically—than when one has used it only once.

A person, then, has in his brain countless patterns corresponding to the countless women he has at some time or other seen; and these patterns vary in the degree of their organization. Some are so slightly organized as to be virtually non-existent as an integrated mechanism; these correspond to the women he has seen but seldom, who have made no great impression on him. Others are highly organized; these correspond to the women he knows well and has seen and thought of often. Now to the average man the woman he knows best is his wife. Whenever the idea " woman " enters his mind, he will, unless special circumstances apply, think of his wife. There is a good physiological reason for this; the neural pattern corresponding to his wife is more highly organized than those of other women, hence is touched off more easily. Jackson summed up these views in the phrase " well-organized symbol-image." The image of one's wife is a *symbol*-image; it is not just the image of a particular woman but, since she is the woman one knows best, it stands as the symbol of woman in general. It is *well organized* from having been evoked so often.

Since the lowest levels of the nervous system are the most highly organized,* it may be assumed that the neural pattern corresponding to one's wife occupies a lower physiological level (a lower " layer " of the highest cerebral centres) than do those of other women. In general, the higher the pathway, the more complex the function it serves. To recognize that the woman you are looking at is your wife is easier than to recognize that another woman is not. The first task is facilitated by long practice; the second involves an act of discrimination. The first task requires only a minimum of alertness; the second, an additional measure of alertness. The healthy man accomplishes this second task seemingly without effort, and so is deceived into thinking it easy; the delirious man's failure at it shows it is not as easy as it seems.

The soundness of Jackson's theory is contingent on the accuracy of his observation that the delirious patient tends to mistake nurse for wife, i.e. unfamiliar for familiar. Is there this tendency in delirium? or are the patient's mistakes

* Physicians sometimes make the mistake of saying that the highest centres are *more* highly organized than the lowest. Thus one writer speaks of the control exercised by the highest centres " over automatic and unorganized motor processes." Another, referring to Jackson's three levels, speaks of the highest as the " third and most highly organized level." These writers confuse " organized " and " complex." The highest centres are the most complex, but they are the *least* highly organized. The most highly organized centre is that in which the connections between the component parts are most stable, most resistant to interruption. It is that which functions most stably under the widest variety of conditions. On this view (which is, of course, Jackson's) the most highly organized centres are the lowest. Thus the centres for circulation and respiration are so highly organized that they function stably day and night under all but extreme conditions. By contrast, the highest centres are so little organized that their smooth functioning is impaired by relatively slight influences; a little alcohol will prevent the most efficient exercise of one's highest faculties. Were the highest centres the *most* highly organized, the mind would lack agility and plasticity; people would be unable to adapt themselves to new conditions, to discard outworn ideas for new ones.

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indiscriminate, familiar being mistaken for unfamiliar as often as the reverse? Clinical experience overwhelmingly bears out Jackson's observation. Since I read his papers, over twelve years ago, I have carefully studied some six dozen cases of delirium (most of them due to bromide), and have seen a host of others more casually. With rare exceptions the mistake is in taking a stranger (physician, nurse, fellow-patient) for a relative or friend. The tendency is seen also in respect of place and situation. The hospital environment is mistaken for home or some other familiar place. The novel circumstances of the hospital are translated into the more homely scenes and events of the ordinary day in a more familiar environment. Two examples are worth citing: (1) A case cited by Hughlings Jackson (2): "A sack dealer was delirious during erysipelas. The house-surgeon opened a small abscess in one eyelid while the patient was in a strait-jacket. The patient's account of these circumstances was that he had been to a public-house, that the landlord fastened him down with two sacks, and then poked out one eye." (2) Weisenburg (3) reported the case of a man with a frontal lobe tumour who was delirious. Weisenburg noted: "When he was first examined by me he thought he was coming to have a hat fitted." Obviously the patient realized dimly that he was seeing someone about his head; one goes to a hatter more often than to a brain doctor.

The tendency to mistake unfamiliar for familiar is seen also in the occupational trends that mark the delirious patient's behaviour. The movements and gestures of one's occupation, which have become automatic from years of repetition, are, in delirium, carried on without relevance to the real situation; the real situation (a novel one) is mistaken for the occupational situation (a familiar one), just as nurse is mistaken for wife.

The tendency is revealed also in the patient's illusions. A farmer was admitted to the hospital in an alcoholic delirium. At the other end of the ward a scratchy gramophone was grinding out a tune; the patient, who thought he was home on the farm, mistook the music for the crowing of a rooster.

The tendency is seen in healthy people too. The lowest centres are the most automatic; they function with the least difficulty. Translated into psychological terms, this means it is easy to follow a well-trodden path, hard to blaze a new one. When confronted with a novel situation, one's instinctive reaction is to fail to appreciate the novelty, and to assume the situation is like others one has faced before. A child who had heard the Lord's prayer many times thought it begins: "Our Father who art in Heaven, Harold be Thy name."

I have said there are rare exceptions to the rule that the delirious patient mistakes the less for the more familiar. Two exceptions I have seen are remarkable cases which really support the rule. In each of these the patient, an elderly woman, mistook her husband for her father. To cite one, the patient married at 28, lost her father at 54, began to be forgetful at 60, and entered a senile delirium at 63. In her delirium she sometimes mistook her husband for her father. She thought her parents were alive and said they had visited her recently. This seems like an exception to the rule, but really isn't. The neural pattern of the father is the one pattern which is apt to be more highly organized than that of the husband; this is because it is laid down in the earliest years of life, while that of the husband is laid down many years later. Childhood, the period when the brain is growing and maturing, is the period when neural patterns are organized most firmly. Thus it is easier to learn a language in childhood than later. So firmly organized are the neural patterns laid down in childhood that even when they lie dormant and unused for years, they may yet be found to have retained their integrity and capacity for activation. There are cases in which a child moves to a new land and learns a new language, dropping the old one so completely that he is thought to have forgotten it; then, falling victim to a severe organic dementia many years later, he stops using his acquired and resumes his native and long unused tongue. In the same way, the neural pattern of the parent, even when he has been dead many years, may remain highly organized in the child's brain. This being so, the question arises, Why doesn't a delirious man commonly mistake the nurse for his *mother* rather than his wife? One may suspect that the crucial factor in this matter is the severity of the dissolution. The two patients who mistook husband for father were demented (senile dementia) before they became delirious; the "layers" knocked out must have been relatively many. By contrast, when a normal person becomes delirious, the layers knocked out are not so many; he funks the harder

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test of recognizing his nurse, but passes the simpler one of recognizing his wife.

Before passing to another aspect of the subject, I pause to pay tribute to the psychiatric insight of Hughlings Jackson. Though he was not a psychiatrist and lacked extensive clinical experience in mental disorder, his ventures, all too rare, into the causation of mental symptoms are fully as illuminating as his more widely recognized work in neurology. This is due in part to his habit of looking upon every symptom, mental no less than physical, as a problem in brain physiology. This attitude enabled him not only to understand some of the things he observed, but to observe more keenly and discriminatingly. Generations of psychiatrists have known that delirious patients are disoriented, but have failed to notice that the disorientation, instead of being haphazard, is governed by the law that the unfamiliar is mistaken for the familiar. Kraepelin, the father of modern psychiatry and one of the brightest stars in the psychiatric firmament, is a case in point. In the eighth edition of his text-book (4) (the last to which I have access), in the first volume, devoted to " general psychiatry " (which takes up symptoms rather than diseases), Kraepelin, in discussing disorientation, makes no mention of the law in question. True, in the second volume (p. 132), in giving a brief sketch of delirium tremens, he said that patients " address doctor and fellow-patient with the names of old acquaintances, regard the place as some locality at home . . ." Kraepelin mentions this merely in passing ; he does not say that this phenomenon, the mistaking of unfamiliar for familiar, is characteristic, much less that it is inevitable. He observed the phenomenon, but its existence as a phenomenon escaped him ; still less did he see any meaning in it. Jackson, whose knowledge of mental disease was as nothing compared to Kraepelin's, but who approached every symptom physiologically, not only observed the phenomenon, but knew he was dealing with behaviour which clarifies the organization of the highest cerebral centres.

Disorientation in Schizophrenia.

The disorientation of delirium, characterized as it is by the tendency to mistake the unfamiliar for the familiar, stands in sharp contrast to that seen occasionally in other psychoses, notably in schizophrenia. Disorientation, an essential feature of delirium, is rare in schizophrenia. There are two ways in which a schizophrenic might become disoriented : (1) He might develop a toxic delirium like anybody else ; (2) his delusions might involve transformations of the environment, causing him to be disoriented even when not delirious. In either case I have observed with significant frequency that the patient identifies his environment, not in terms of the places and persons he knows best, but of places and persons that are strange, remote, even bizarre. Here are some examples, all but the last from patients I saw at the Harrisburg (Pennsylvania) State Hospital.

Case 1.—A man, aged 40, entered a catatonic stupor which cleared up after four months. During the psychosis, when asked to name the place, he answered, perplexed, " Some people say it's Italy, others say it's Ethiopia " (it was at the time of the war between them). After his recovery he remembered this ; he said he had heard people discussing the war and had thus got the idea that the place was one or the other of the two countries. He recalled also having had the idea that it is the planet Mars.

Case 2.—A schizophrenic, aged 25, told me (in mid-winter) that the place was Alaska. He could not be induced to say how he knew this. Later, when more talkative, he recalled the remark and said he had been impressed by the snow outside.

Case 3.—A middle-aged schizophrenic at the Harrisburg State Hospital knew that the place was a hospital, but when asked to name the city he replied " Germany." When I expressed surprise, he added, " I don't know—but it's overseas somewhere." This he insisted on. When told it was Harrisburg he would not believe it.

Case 4.—A schizophrenic, aged 21, developed a bromide delirium, from which he recovered. In his delirium he named the place (the Harrisburg State Hospital) as " China or Japan." On recovery, when questioned about this statement, he remembered it and said he had got the idea from seeing the attendant putting shoes

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on a man who made a wry face, as if the shoes were tight; the tight shoes made him think of China. (This was in 1936.)

CASE 5.—A schizophrenic, aged 26, in an alcoholic delirium, mistook me for Chancellor Dollfuss. It was in 1934, soon after the assassination of Dollfuss, when his memory was still fresh.

It is to be emphasized that these patients came from rural areas and small towns in central Pennsylvania. They were simple people and had not travelled widely. None had visited a foreign land, and several had not even been out of the State.

The next case is different from the foregoing, but resembles them in the nature of the disorientation.

CASE 6.—This middle-aged man I knew only as a friend; I did not see him in his final illness. He was a recognized expert in one of the social sciences related to the work of governmental agencies and had long hoped to get an important government job, but for one reason or another this was never achieved. He died of cancer of the lung, and in his last few weeks showed a grandiose paranoid psychosis due possibly to cerebral metastases. In his psychosis (1939) he thought the place was Geneva, and believed he was playing a prominent role in the affairs of the League of Nations. At the same time, looking out of the window, he recognized the familiar aspect of the city in which he lived—X. He reconciled these two ideas by saying that the League, at enormous expense, had erected a replica of X in the heart of Geneva. He could not be shaken from the belief that the place was Geneva.

These six cases stand in sharp contrast to delirium. In delirium the less familiar is mistaken for the more; in schizophrenia and allied disorders (if there is disorientation) the more familiar is likely to be mistaken for the less. (In the foregoing sentence, by delirium I mean delirium in non-schizophrenics; when a schizophrenic becomes delirious the schizophrenia shines through the delirium, and the disorientation is likely to be of the type seen in other schizophrenics, as in Cases 4 and 5.) The delirious patient believes he is at home, surrounded by family and friends; there is a simple homespun quality to his behaviour and ideas. By contrast, schizophrenics, when disoriented, show a curious exotic trend, as in their statements that this is Italy, Ethiopia, China or Japan, even Mars. In talking to a delirious man you could easily imagine that you are not his physician but just a friend calling on him at his home, his attitude fitting just this type of occasion. The schizophrenic, characteristically, does not give you this feeling; his propensity for strange and unfamiliar orientations imparts to his thought an exotic flavour most unlike the homely informality seen in the delirium of the non-schizophrenic.

Case 6 illustrates another difference between delirious and delusional disorientation, one to which I alluded in an earlier paper.(5) This has to do with insight. The delirious patient has no insight into his disorientation; he does not know that other people regard him as disoriented. By contrast, the non-delirious patient who is led astray by his delusions has, in some cases, insight to the extent that he realizes others disagree with him. Not being delirious, he has fundamentally a clear grasp of his surroundings, notwithstanding that his delusions lead him to view his environment in a false light. He realizes that his opinions are contradicted by evidence that is plain to him and to everybody; and while he believes other people are mistaken, he knows *they* believe *him* to be the one who is wrong. Case 6 illustrates this beautifully. The patient thought he was in Geneva, yet recognized the familiar aspect of X, the city in which he lived; he knew there was a gap here, and he bridged it by saying that a replica of X had been erected in the heart of Geneva. In the paper already mentioned,(5) I reported two cases (Cases 2 and 4) in which a bromide delirium was followed by a paranoid aftermath in which the patient, though no longer delirious, continued disoriented, but the disorientation now was paranoid rather than delirious in character. Thus in Case 4, the patient knew the place was *supposed* to be the Harrisburg State Hospital and I a physician, but she doubted both. She was convinced the year was 1933 instead of 1931 but knew others considered it 1931; she thought they said 1931 to see if they could deceive her, in order to test her mind. Letters post-marked 1931 did not convince her; they could be several years old, even though they looked fresh. The dateline on newspapers did not convince her; it would be simple to date incorrectly the papers destined for the Hospital. I asked her what she would think if she went

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into town and bought a paper at a news-stand of her own choice; she thought that even under these conditions the false dating could somehow be pre-arranged.

Why should delirium be marked by a different type of disorientation from schizophrenia? Obviously the two psychoses have different cerebral processes underlying them. No attempt will be made to define the difference, except to say that the process which underlies delirium would seem to be the simpler of the two. The mistaking of unfamiliar for familiar means, as has already been pointed out, that a more complex function has been lost while a more automatic one has been retained; presumably the topmost layers of the highest cerebral centres have been knocked out, while those next below are intact—a simple and understandable pattern of reaction of the brain to noxious agents. By contrast, to mistake the familiar for the unfamiliar, as in some cases of schizophrenia, is a reaction which cannot be due to a simple mechanism; it cannot be due to the loss of merely a few topmost layers; a more complicated type of dissolution must be assumed.

Summary.

Delirious disorientation illustrates the value of viewing mental symptoms as manifestations of disordered cerebral function. Delirious disorientation with rare exceptions obeys the law that the unfamiliar is mistaken for the familiar, as when a patient in hospital surrounded by hospital personnel thinks he is at home surrounded by family and friends. Incidentally, it is shown that this law does not apply to those few schizophrenics who are disoriented; such patients are apt to mistake the familiar for the unfamiliar, as when a patient who has never been abroad says the place is some remote foreign country. The mistaking of unfamiliar for familiar is a clear example of what Hughlings Jackson called "reduction to a more automatic condition."

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NEUROSES IN FIREMEN.

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WHEREAS much has been published on the psychological reactions, normal and abnormal, in the personnel of the armed forces, little has been written about the neuroses in Civil Defence personnel.

This paper is a survey of cases of neurosis occurring among firemen who were admitted to Mill Hill E.M.S. Hospital from the outbreak of war to October 1, 1944. Altogether 70 patients came from the Fire Service. 40 of them came from London (postal area). No figures can be given about the incidence per number of personnel or per area. But, considering that these 40 men were probably all the firemen in London, north of the river, who required in-patient treatment on account of neurosis during five years, it can be taken that the incidence of serious neurosis was very low. The group of neurotic firemen can be compared with a population of neurotics from the armed Services (as analysed by Eysenck, *Journ. Ment. Sci.*, 1944, **90**, 851).

TABLE I.

	Age above 30.	Married.	Total.
Firemen	39	63	70
Service personnel	270	463	700

As can be seen from Table I, the firemen, as a group, were older than the Service patients, and a higher proportion of them were married at the time of their admis-

TABLE II.

	Psychiatric family history.	Neurotic traits.	Total.
Firemen	23	27	70
Service personnel	275	488	700

sion. As Table II shows, a history of psychosis or serious neurosis in parents or siblings was slightly less frequent in our group; the difference, however, is not statistically significant.

A history of neurotic traits in childhood, or in adult life, is markedly less frequent in the firemen than in the controls; this must be read in conjunction with the frequency of war stress in the strict sense, i.e. the exposure to enemy action.

TABLE III.

	Bombardment.	Separation.	Domestic troubles.	Total.
Firemen	36	3	10	70
Service personnel	137	469	202	700

Table III gives the incidence of the more common psychological factors of aetiological significance in the firemen and the control group. It will be seen that exposure to bombardment (including bombing and shelling) is much more frequent in our group than in the controls. In contrast, domestic stress and separation and regimentation figure much lower, for obvious reasons. In one case resentment against the lack of discipline was noted as a precipitating factor. It is worth

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noting how low the incidence of unsuitable employment as an aetiological factor ranks, which was mentioned in only 12 cases. The fire service consists of a nucleus of regular firemen, a large body of volunteers, and a very small proportion of conscripts. It is known from all services that volunteers are less likely to break down than conscripts, in particular when the numbers of volunteers for a particular assignment is large enough to allow for the exclusion of the less suitable—in other words, when the self-selection can be improved on by a rational selection process.

Volunteers in war time are of many shades; volunteering for one activity may mean trying to evade another less desirable one.

In our case-notes the reason for joining the Fire Service was stated only in 48 cases. Of those firemen in whose case-histories the reason was mentioned, 14 had volunteered before the outbreak of war (part time) and were called up for full time duties, 13 joined the A.F.S. because they found themselves out of work, and 5 frankly stated that they joined the A.F.S. in order to avoid any service with the armed forces. This latter psychological position may work in two directions: it may make for lower morale, and therefore lower resistance to stress, as compared with the genuine volunteer; or the desire to escape alternative duties may increase the tendency and capacity to stick to the chosen one. Finally, these antagonistic tendencies may clash, and so produce or prolong a neurotic illness.

The diagnoses in our 70 cases were:

Anxiety state in	36	cases.
Hysteria in	12	,,
Depression in	17	,,
Miscellaneous in	5	,,

All cases of *hysteria*, with no exception, developed as the immediate result of enemy action. All had experienced near misses, most had suffered minor physical injuries, and the symptoms and signs for which they were admitted some time later were hysterical prolongations or exaggerations of these injuries. This uniformity of the clinical picture is probably due to the selection of cases; they were war cases, for which the E.M.S. (and in some cases the M.O.P.) had taken responsibility. In two of these cases causative factors could be discovered which might be called "fire-service-specific," i.e. pre-existent factors which accounted for the fear of continuing in the Fire Service. Both men stated in retrospect that they had always been afraid of heights and of climbing ladders; both of them had been able to control their fears in the normal course of duties, but once broken down, they were not able to regain their previous, precarious adjustment. Another man had suffered all his life from fear of the dark; he had managed satisfactorily as long as he worked in the team, but he had grown increasingly tense and anxious when on watch-room duty, while the other personnel went out to incidents. He broke down, with hysterical symptoms, after a near miss and could not face his responsibilities again.

The following is the history of a typical case:

Sub-officer D—, aged 42.

Family history.—Nothing contributory.

Personal history.—No neurotic traits as a child. Joined the Royal Marines at age of 17 in 1917 and left after six years' service. Joined London Fire Brigade. Served in latter satisfactorily through the early blitz until September, 1940, when he was blown 20 ft. to the ground by the unexpected explosion of a time bomb. Had no injuries or unconsciousness, but was dazed, limp and speechless. In next two days developed weakness of right arm, jitteriness and intolerance of noise. Recovered and returned to duty after one month's rest, though he had still some pain and weakness in his right arm, but all symptoms, especially paralysis of right arm, reappeared after he received some minor injuries in another bomb explosion. He was a quiet, conscientious man with few interests outside his work and home. Hypnosis produced a state apparently similar to that in which he was on the night of the first incident. This patient was persuaded to acknowledge his fear, and recovered rapidly when he was found work as an instructor in fire-fighting away from London.

The type of *anxiety state* seen most frequently was gradual in onset. Increasing tension culminated in a breakdown when the stress continued long enough.

The stress in most cases was fear of bombing, often exaggerated by long hours of strenuous duty, lack of sleep and worry about wife and family. In a few cases, such as the following, a specific traumatic experience was the precipitating factor.

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Fireman B—, aged 30.

Family history.—Nothing significant.

Personal history.—Enuretic until 14. Walked in his sleep as a child. Had a good work record and joined A.F.S. full time in 1939. Served successfully through the blitz, though considerably frightened. In 1944 during the flying-bomb period he became increasingly tense, and was most severely upset by rescuing bodies from wrecked buildings. Following this, he developed headaches, feeling of panic when planes went over, and other anxiety symptoms. He stopped eating meat because it reminded him of the dead bodies. On admission he was tense, anxious and apprehensive, preoccupied with his memories. He improved considerably with treatment, and following discharge from the N.F.S. was returned to civilian employment.

In a few cases the presence or the fear of responsibility was the main aetiological factor.

Lfm. T—, aged 34.

This patient complains of a feeling of inward tension with a nervousness that occasionally gets out of control, and which becomes manifest as a twitching of the mouth.

He has always been a sensitive, rather highly strung person, who none the less has made a good adjustment and who has always been a worth-while individual. He was a volunteer member of the A.F.S. before the war, and was mobilized to full time duty in September, 1939. He has since served with the minimum of sick leave and has always been considered a good man. Apparently he served efficiently throughout the blitz period.

He was promoted to leading fireman in March, 1943. He felt aware of his limitations, but nevertheless urged himself to the acceptance of responsibility. He had one or two setbacks, which he took to heart and which made him diffident in the role of leading fireman. He noticed that on instructional duties he was apprehensive of making mistakes, and that then it was that the feeling of anxiety came over him. Further administrative responsibilities made him feel worse. This dilemma between his timidity and his desire to be perfect made him want to give up his rank and revert to that of fireman.

In the following case, which belongs to the effort syndrome group, the patient illustrates the psychogenesis of the syndrome well; he also shows the effect of stress in an obsessional personality; the freedom from personal responsibility in the A.F.S. during the early stage of the war led here to a temporary improvement.

Ch. M—, aged 30.

Son of a strict, methodical father, and an anxious mother. Satisfactory school and work record. Diphtheria at eight, followed by palpitation; forbidden all sports. Sociable and ambitious; very obsessional. Joined A.F.S. part time before the outbreak of the war; felt the strain of his work and the additional A.F.S. duties; developed headaches and worried excessively. Called up for full time duties in September, 1939; found life much easier and health recovered. November, 1941, felt the strain of responsible work as sub-officer. While on leave he had to run for a train; felt palpitation and pain in his chest. Symptoms persisted, and became worse, when in 1942 his work became more complicated and responsible. Worried about his work; kept re-checking it; could not sleep. Developed various tics. On examination no signs of cardiovascular lesion. Depressed, worried, irritable. Recovered with psychotherapy.

Most cases which were admitted in *depressive states* had shown a previous tendency to a depressive reaction. Most of the cases diagnosed as depressions showed symptoms of anxiety as well. The following case is an example of this type of reaction. The patient is one of those men who joined the F.S. in spite of his fears of heights:

B—, aged 32.

Family history.—An uncle committed suicide in 1918.

Personal history.—Always disliked heights and ladders. Good work record. Joined the A.F.S. in 1938 and was called up in 1939. He has had several periods of depression in his life before he joined the A.F.S. During the blitz period he developed another depressive reaction due to loss of sleep and worry over air raids. He had suicidal thoughts, nightmares, loss of weight and was sent to hospital, where he was depressed, had fits of crying and felt he had let down his comrades. He made a steady improvement and put on weight.

It may be finally worth quoting a case of mixed aetiology; an old regular fireman in whose case age played some part in addition to the stress of responsibility, exposure to enemy action, and the relaxation from stress, the "delayed effect" first described in sailors by Curran and Garmany (*B.M.J.*, 1944, i, 144):

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A.E.P. District Officer, L.F.B., aged 45.

Complaint.—Loss of grip and depression since October, 1940; headaches.

Family history.—*Nil* significant.

Personal history.—No neurotic traits. Good school record, both at lessons and games, and good mixer. Occupation: Joined Navy at 15 for eight years; became Petty Officer; served through the war and in several actions without any nervous symptoms. After the war joined the Fire Brigade; has worked hard and is now district officer in charge of 300 men and six fire stations. Married October, 1919; two children, both well. Very satisfactory home life.

Personality.—Keen, efficient, conscientious man. A home bird, with few interests outside his home and work. Liked entertaining at home. Felt responsible for his work all the time, and frequently went into the office on his day off. Had never known any real depression. Alcohol and smoking—moderate.

Present illness.—In September, 1940, he bruised his back; was five weeks off work. When he returned, the London blitz was in operation and his work and responsibilities increased enormously. He made every effort to keep up with them, but was not only prevented from getting adequate sleep by his work, but was unable to delegate much of his responsibility to his junior officers, and had to keep his eye on every detail of the job. About October, 1940, he began to feel run down and nervy. He trembled while waiting for a call after the warning had gone, although he felt all right when working. Became irritable and sleepless. He lay awake planning his job for the morrow, or thinking about the events of the day. Went off his food, and used to get a pain in the left chest and down the left arm when he walked. Began to feel a pressure on back of the head, especially after a night's worry. In November he took a week's annual leave, had a quiet time on a farm, and felt somewhat better, but relapsed soon after he returned to work. He began to worry whether he would be able to hold down the job, and lacked confidence. During the City blitz at the end of December he was on duty for a fortnight on end and felt very tired, but carried on, sleeping in snatches. After the rush was over he felt "right down on the floor," nervy, irritable, depressed and tearful, afraid others might see him in this condition and of then getting the sack. Early in January he saw a doctor and was given a month's sick leave. He improved a little and started work, but relapsed soon after he returned.

Condition on admission.—Quiet, co-operative, no over-anxiety, but tears come into his eyes when he talks of his job. Gunfire and bombs now make him want to hide, although he has never given way to these feelings when working. He finds it difficult to concentrate, and hard to leave off and rest. His mood is somewhat depressed, his sleep disturbed, appetite fair. His intellectual functions show a slight retardation, otherwise normal. Insight: He believes his condition is due to work, worry, responsibility and danger, but is very anxious to recover and go back to duty, and is scared he may be pensioned off.

Diagnosis.—Anxiety state in a conscientious, worrying personality.

Progress.—He has improved considerably in health, but remains depressed, mainly in connection with the fact that he has been discharged from the Fire Service.

Among the miscellaneous diagnoses was one case of traumatic personality disorder following head injury, one case of asthma and eczema, one of disseminated sclerosis with an hysterical overlay, and one "queer personality," a man who held peculiar religious beliefs and quarrelled with his colleagues and his superiors.

Summary and Conclusion.

A survey of all the cases of neuroses in firemen admitted to an E.M.S. neurosis centre shows that the total incidence of serious neurosis must have been very low. Exposure to enemy action was the most frequent causative factor in a population which had a lower incidence of neurotic predisposition than a group of neurotics from the armed forces.

The types of reaction did not differ materially from those of the control group. A small number of men had shown traits which should have disqualified them from fire-fighting duties, viz. fear of heights, fear of the dark, and previous nervous breakdown of a depressive kind. Though the men in question had stood up to a considerable amount of strain and given valuable service up to the time of their breakdown, they were unable to readjust themselves again to the same conditions once they had broken down.

Depressive reactions in the past are of ominous prognostic significance.

A man's attitude towards responsibility should also be taken into account before he is given promotion; a highly conscientious man who may be a valuable member in low rank may break down under the strain of responsibility for which he does not feel suited.

We wish to thank the Medical Superintendent of Mill Hill Emergency Hospital for his permission to use this case material.

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EXPLOSIVE RAGE FOLLOWING HEAD INJURY.

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[Received June 25, 1945.]

In 1899 Kaplan described the "explosive diathesis" as follows: "Following the most trivial and impersonal causes, there is the effect of rage with its motor accompaniments. There may be the most grotesque gesticulation, excessive movements of the face, and a quick, sharp explosiveness of speech; there may be cursing and outbreaks of violence, which are often directed towards things; there may or may not be an amnesia for these afterwards. These outbursts may terminate in an epileptic fit. There is an excess in the reaction, with inadequate adaptation to the situation so remote from a well-considered purposeful act that it approaches a pure psychic reflex act in the shape of an almost or entirely unmodified explosion not unlike a convulsion. The explosive diathesis is not characteristic of head injuries, but is also found in hereditary degeneration, in alcoholic degeneration, etc."

We have been unable to trace any descriptions of these cases in the literature; although many authors quote Kaplan's descriptions and refer to the "diathesis" as a complication of head injury, no cases have been described. Kaplan himself gave the above description in a paper on the part played by head injury in the genesis of mental disease; he promised to amplify in a later paper, but as far as we can find out, he never did so.

A diathesis is a constitutional predisposition; therefore a diathesis cannot be a complication of head injury. Although it may be that some of these cases have a constitutional predisposition towards exhibiting excessive rage, what is described by Kaplan is not a diathesis, but a symptom. It is a symptom that occurs after head injury, in epilepsy, in mania, in depression, and among aggressive psychopaths. It is becoming increasingly important, as head injuries become commoner both in war and peace. Furthermore, owing to the nature of the symptom, the subjects showing it are liable to come up against the law. It seemed advisable to investigate these cases with present-day psychological and physiological methods, which were not available to Kaplan.

This symptom is something different from the state of irritability which is so common after head injury; indeed, four of this series were not irritable apart from the attacks; it has an explosive element which lifts it out from the background, whether the background is one of normal mood or irritability or depression. It is a rare condition; in a series of 2,000 cases of head injury, only 10 cases exhibited attacks of explosive rage coming on dramatically subsequent to the head injury.

Case 1.—This patient, aged 34, was born in a caravan and brought up in a travelling fair, having no settled home and being taught in as many as two or three different schools in a week. He did fairly well as a scholar, considering the drawbacks he suffered, leaving school at the age of 14 in Standard VI. Since then he has spent his life in the travelling-show business, riding in the "wall of death" on a motor cycle, and running a boxing booth. It might be thought that his upbringing and mode of life did not encourage the formation of a very stable character, yet he was apparently hard-working, even-tempered, reliable, and to some extent a successful showman. He asserts he was always placid and happy-go-lucky in his dealings with other people; if he had been at all short-tempered he would never have been able to carry on in the boxing booth, as he was not a particularly skilful boxer and needed all his wits to keep off the energetic local aspirants. As it was he was frequently floored, and on at least a dozen occasions had been knocked out. There is no history of epilepsy or any nervous instability in the family.

There is no indication of any neurotic traits in his personality, though, like most nomads, he was superstitious and given to reading omens into unimportant and adventitious happenings. At the outbreak of war he volunteered for the Army, and after three months was made a corporal.

In 1927, while riding on the "wall of death" he shot over the wall on his motor cycle, hitting the left posterior parietal region of his head on the ground. He is said to have been

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unconscious for four days; he had headaches for a few days, but after a month in hospital he remained perfectly well.

His present illness dates from an accident while on duty near Newmarket on the night of December 13, 1939. He was leaning over the radiator of a lorry repairing the engine when he was suddenly aware of a screech of brakes on his left-hand side; he just had time to see two car lights almost on top of him as he turned to his left, when he was struck on the left hip by the skidding car. He remembers no more, but apparently he was dragged some 20–25 yards further down the road before his head struck part of another stationary lorry.

He had a post-traumatic amnesia of two and a half days. As he came round he was vaguely aware of the ward surroundings, but at the same time he seemed to hear a confused jumble of voices, shouts, and the noise of brakes being applied; he saw two yellow car lights and had a vivid impression of being dragged along on his back—these sensations lasted about two minutes in his own estimation before he became fully conscious. He was kept in hospital twelve weeks, making an apparently fair recovery, but still having frontal headaches two or three times a week. On return to his unit he soon noticed his first symptoms of loss of temper; he does not remember the actual incident, but he apparently became aggressive and threatening towards another man. After this incident he was sent to a mental hospital because of his extreme aggressiveness and threats of violence.

He was ten weeks in this mental hospital, where he once, shortly after admission, attacked two male nurses in a fit of temper.

From June, 1940, till his admission to the Military Hospital for Head Injuries at the end of October, 1940, he remained with his unit. He was continually up before his officers on charges of violence; the slightest provocation would make him strike out blindly, even at his superiors; two pints of beer would turn him into a dangerous maniac. In the words of his M.O., "In one of these frenzies, which I myself have seen and which I can vouch for being genuine, after only three and a half pints of beer it took four men to hold him down."

He had never been in any trouble before his head injury, and this inexplicable change in his behaviour made his M.O. suspect that he must still be suffering from the effects of his trauma. On his advice he was put to work on his own, and worked excellently on the repair of motor vehicles, but still could not brook any interference or reprimand.

Further inquiry showed that between his violent outbursts he remained his old cheerful, easy-going self, and that all, or nearly all, the explosions of rage occurred in a very definite manner, which the patient himself described spontaneously as "something like a fit."

These attacks took the following form:

(1) He would be aware of an intense feeling of restlessness and uneasiness "as if something was going to happen," which lasted two or three minutes. This feeling usually came on for no apparent reason, but might occur if someone said something which irritated him. It was, however, something subjectively much more vivid than mere irritation.

(2) He would then have an hallucinatory experience. This consisted of the sudden sound of brakes squealing, the confused noise of men shouting and the appearance of two car lights on his left-hand side, which were present even if he shut his eyes. He seemed to feel something heavy, like wheels, going over the side of his head (as far as is known this did not occur at his accident). The whole hallucination, which did not last more than a minute and probably only a few seconds, was accompanied by a feeling that the patient never liked to describe—"It's terrible, terrible, worse than anything I know; I'd sooner be dead than go on feeling like that."

(3) All this was followed by a sudden severe stabbing pain in the right side of the forehead and a "crushing, crumbling feeling on the left side of the head." During this third stage he felt unsettled, bad-tempered and aggressive; his appearance altered and he assumed a sullen, shifty look; there appeared to be some slight oedema around the eyes and of the lips, but no flushing of the face and no noticeable alteration in blood pressure or pulse rate. This stage lasted anything from half an hour to a whole day, and during it if anyone checked or annoyed him he became very violent. Usually, but not always, he had a subsequent amnesia for happenings in this period. If he was alone he would continue with his work, but might break his tools or throw them on the floor for no apparent reason. While in hospital he once tore up all his snapshots and knew nothing about it till later he found to his chagrin the torn fragments.

(4) The third stage almost invariably ended with another hallucination: he heard a vague confused jumble of voices for two or three minutes and soon began to realize that his bad temper had left him. It was frequently in this way that he would become aware that he was in the guard-room under arrest and would wonder how he got there. After the hearing of this jumbled noise he had a mild, heavy feeling across the brow for some hours.

During his stay of four weeks in this hospital he had about a dozen of these attacks. He made a great effort to control himself, and when he felt an attack was imminent he would go off by himself so as not to lay himself open to any circumstances which might lead to violence. Apart from tearing up his snapshots during one attack and several times being extremely rude and threatening to the nursing staff (a trait quite out of keeping with his normal character) he did not give way to these impetuous urges. He often has the feeling that he would like to break down and cry, but he does not let himself.

Clinical examination.—His mood is cheerful, helpful and full of fun; he likes to sing and to do tricks to amuse the nurses and other patients; but at times he is sullen and argumentative, although always respectful towards officers.

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Sample of talks.—" Well, Sir, I can talk to you. It's like this. When I'm like this, I'm alright; but when I get that feeling, honest, I'm telling you, I might be sitting quiet and a man comes up to me, say that Sergeant, and pushes me or shouts at me, and in a minute I'll straighten his face out. . . . Well, it drives you crackers, people arguing with you; I got to slug 'em, it makes you mad. . . ."

Intelligence.—His intelligence as judged by the routine tests for memory, performances and general information was average for his education and social standing.

Personality.—He is somewhat egocentric, rather boastful, and his vanity is tickled by a little flattery. He is usually cheerful and good-tempered, and mixes well with the other patients, being well liked by everyone. He was described two years later by the Sister who looked after him as a most charming personality. He liked to be the centre of attention, and would relate to the nursing staff tales of his experiences in France, in which he always played a heroic part.

Attitude to the Army.—He enjoyed every minute of the army before the accident; but since then everything seems to have gone wrong. He says, " I haven't had a square deal; chaps nag at you for no reason at all, and if you say anything at all, you're on a charge." Before his accident he never resented discipline or being shouted at; now he cannot bear having anyone over him. If any of his mates pulls his leg he flies into a fearful temper, whereas before his accident he was easy-going and " always ready to make a mug of myself for fun."

Physical examination showed no abnormality in the central nervous system or of the alimentary, respiratory or cardio-vascular systems.

Radiogram of skull normal. Air encephalogram showed slight generalized atrophy of the left frontal lobe. The body of the left ventricle is broader than the right, and the anterior part of the left frontal horn extends further forwards and upwards than the right. C.S.F. pressure 120 mm.; protein = 35 mgm. per 100 c.c. No excess globulin. Cells = 0. W.R. negative in blood and C.S.F.

Electroencephalogram showed throughout the record bursts of high-voltage waves of great frequency, characteristic of epileptic disturbance. The pattern of the wave strongly suggests that this patient falls into the group of the psychomotor epilepsies.

This example of explosive rage raises the question of the relationship of the symptom to the previous personality. Is this symptom due to an unmasking of a previously latent trait of the personality, or is it something new in this person's make-up, such as the change in behaviour which follows epidemic encephalitis? This patient, before the head injury, could not have been considered neurotic or psychopathic by any standards. After the head injury he showed no other changes in personality besides the explosive rage; he remained cheerful and ready to help and amuse, pleased with himself and extroverted; he was not bad-tempered apart from these outbursts, and he was not depressed.

Similar in all these respects is—

Case 2.—This pilot-officer, aged 31, had been educated at one of the larger public schools, and did well at work and games. He had been very successful in his career, a professional one, being the youngest man in the country to hold the particular job which he held. His wife states that he was always cheerful and never irritable. His colleagues confirm this opinion, and add that he had a particularly good memory.

He was admitted to High Wycombe Hospital comatose from a head injury, bleeding from the right ear, and with a fracture of the right tibia and fibula.

When he arrived at this hospital he still had a right facial palsy, and hearing was impaired on the right. Later his retrograde amnesia was 24 hours, his post-traumatic amnesia 19 days, with small islands within this period.

He was a difficult patient, always complaining about every little thing, such as the food, and the unreadiness of the nursing staff to fulfil immediately his many requests; he was impatient at being in hospital. He said himself that he was now liable to tantrums which he had never had before; he found his memory slow and very poor compared with what it had previously been. Investigation showed that the loss was for recent events only; it was moderately severe; for example, he could not remember the names of the nurses in the ward, although he was often told. This defect in remembering would make him irritable whenever it became obvious to him.

One day the following incident occurred: He was walking along the corridor on crutches, his right leg in plaster, accompanied by Sister. On coming to a step 4 in. high he lost his temper, becoming wildly agitated. He insisted that he could not surmount the obstacle, and that the help the Sister was giving him was useless. Two orderlies arrived, but the patient became more excited, crying and shrieking out, first that they were pushing him on his face, then that he would fall on his back, and did not they realize that he weighed 15 st.? He screamed that they were fools and quite useless, and would no one come and help him. Within two minutes he had recovered his composure, and was profusely apologetic. Similar lesser outbursts had been occurring since his admission, but before this incident they had taken the form of moods of increasing impatience and fidgetiness.

Radiogram of skull (Major Hugh Davies).—There is a Y-shaped fissure of the right parietal and temporal bones. One limb of the fracture is passing deep into the right temporal fossa.

The EEG was grossly abnormal 19 days after injury. There was a persistent rhythmic wave, with a frequency of 1 to 2 a second in both hemispheres. It was much more persistent, and had a much purer form on the right side than on the left. One week later the EEG was practically normal. There were very occasional isolated slow waves in the occipital regions, but the record

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was practically within normal limits. A fortnight later there was no change in the EEG from the previous record. It was considered within normal limits, although there were still occasional waves 2 to 3 a second, which may have been normal for him.

This patient apparently showed no abnormal aggression before the head injury; these outbursts seem to have been something entirely new. In such a case, before the head injury, there would have been no reason to suppose that this person might develop attacks of violent rage; nor would there have been reason to forecast that this form of mental disorder would be the one to which this person would succumb, given that a head injury in this case were followed by affective disorder. Indeed, as far as can be judged on the evidence, a knowledge of the previous personalities of these two cases and some of the others presented would not have led an observer to think that sufficient instability were present to cause any form of mental disorder; although it may justly be said that without a knowledge of subconscious tendencies or previous features of the personality no reliable opinion on this could be formed.

The following case can also not be said to have been predisposed to explosive rage, although his previous personality was less well adjusted to his environment than those of the former two cases.

CASE 3.—This sergeant was complaining of headaches, fits of depression and fits of uncontrollable rage.

On June 25, 1940, he had been involved in a motor-cycle accident. The retrograde amnesia was 9 hours, the post-traumatic amnesia 7½ hours. There was bleeding from both ears, nose and mouth. Five weeks after the accident he got up, and a short time later he went home.

Two days after his return, without any reason apparent to himself or others, he suddenly began to feel depressed; he wanted to sit down and cry. As the result of a trivial disagreement with his wife, he flared up and went "almost raving mad at her" for about ten minutes. He shouted and stamped around the house, hardly realizing what he was doing. Then he became aware of his behaviour and was filled with shame at his outburst. In the following week he had two further moods of depression, culminating in an outburst of rage against his wife over some trivial incident; on one occasion his wife asked him to go round the corner to get a bottle of milk; he immediately flew into a rage, asked if she thought he was the milkman, and then rushed out of the house, walking five miles before he fully realized what had happened.

Three or four more of these attacks occurred during these first three weeks of sick leave. He became so worried about these inexplicable outbursts of depression and anger that he reported sick. Taking his medical officer's advice, he tried going for a walk when the depression came on, but he felt anxious lest he might become violent should anyone speak to him in the street. He had had several more typical outbursts before he was admitted to hospital. They would come on only during periods of depression and irascibility. During these periods minor incidents would rouse him to heights of rage; his face would be pale, his hands and forehead would sweat profusely; his expression would be sullen and he would curse and yell. He knew no cause for the onset of the period of depression, but the actual outburst of rage did need a trigger—a small incident which would not have caused any upheaval when he was not in a period of depression. In one of the outbursts he threatened to kill another patient, and when restrained, kept hurling insults at him, and the nurses. On the following day, although self-pitying, he was still much occupied with his dislike of the other patient. The periods of irritability and depression would last from half to one hour. He had insight into the change in his behaviour, and stated that this was something quite foreign to his previous character.

Apart from the outbursts he was usually irritable. He also showed some intellectual deterioration—a factor not present in the two other cases so far described.

No family history of mental or neurological ill health.

Previous history.—He reached Standard VI at school, leaving at 14. After working as a labourer for four years he joined the regular Army at the age of 18, and became a sergeant in four years. He describes himself as having been cheerful, even-tempered and amicable; a description fully substantiated by reports from his officers.

Physical examination.—*Nil* abnormal.

Radiogram of skull normal.

C.S.F. Pr. 130. Constituents normal.

EEG was repeated on several occasions; it showed the normal 10 a second frequencies in the posterior portions of the hemisphere and in the parietal areas, where there was, in addition, an oscillation of frequency between 18 and 20 per second, of which the voltage was at times as great as that of the 10 a second frequencies. There were no abnormally slow frequencies in the record, and the response to hyperventilation was a normal one.

As it was seen that he was beginning to think he had better be discharged from the Army, it was decided to send him back to duty.

On June 9, 1941, he was readmitted. The story was that on leaving hospital he was sent on a month's sick leave by his unit. When he was at home his fits of depression and uncontrolled rage and headache became worse. The least little thing seemed to irritate him, causing him to flare up, although he always felt sorry afterwards. On returning to his unit he had seven different moves. During this time he was always reporting sick. In view of the nuisance he would be in the Army, it was recommended that he be discharged from the Service.

On the evidence concerning this man's previous personality it would not have been thought that he was excessively aggressive. We were informed that in childhood he had been treated as a semi-invalid, as a doctor had said he had a cardiac murmur, but although this may have

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interfered with a normal psychological development, it did not cause any outbursts of rage or even irritability. However, it must be admitted that in this case there was insufficient evidence about his previous personality for it to be known whether the head injury had unmasked a previously latent character trait, or if it had introduced something new into his make-up.

In these cases the head injury played an all-important part in the genesis of this symptom. The following case came under our care as he had had a head injury; but this did not play a part in causing the symptoms. It also raises the question of the possible relation of the symptom to epilepsy.

CASE 4.—Gnr. H—, aged 29, was admitted to this hospital on March 24, 1941, complaining of headaches, depression and fits. He had sustained a head injury ten years ago, when he had fallen from an apple tree on to the back of his head. The retrograde amnesia was a few minutes, and the post-traumatic amnesia about 24 hours. He states that he was kept in hospital a few months, during which time he can recall no symptoms, stating he had no headaches, although he thinks he may have been depressed. The only thing he can remember is that a few weeks after leaving hospital he had a fit. He was walking along when he fell to the ground unconscious, without any warning; he was unconscious for about 15 minutes; there was no incontinence or tongue-biting; on waking he had a severe headache, which lasted the rest of the day. He can give no details as to how many fits he had, but they occurred at any time of day or night. After the first few fits he was incontinent of urine during the attack. He was readmitted to Cardiff Royal Infirmary, where the fits were seen by the medical staff. He was told that his face twitched during an attack, and that his limbs moved. He never had an aura, and none of the fits was of Jacksonian type. He continued to have attacks until 1936—that is, six years after the injury. When the attacks ceased the headaches persisted, and have become more frequent in the last few months.

He has suffered from depression since the injury. He found that he did not want company, preferring to be alone. Often at night he would walk out into the country on his own, and there he would sit, savouring his solitude and depression. His mind was more or less a blank during these periods, and he thought of nothing in particular. He knew of no reason for his depression. He did not work for some years following the injury. He married some years ago—he does not remember how long. For about three years he was working as a cook and spending his evenings making wireless sets. During this time his headaches were severe and frequent, and he was rarely free from them.

One night, nearly three years ago, his wife asked him to stop his work and come to bed. His mind then went blank; when he awoke he was sitting in his chair and the room was full of people. Apparently he had smashed the wireless set in a rage and then tried to strangle his wife. He very nearly succeeded, but her screams brought in the neighbours. He was extremely worried about this, as he was deeply in love with his wife. He had never had an outburst of rage like this before.

One year ago he volunteered for the Army, saying nothing about his history of fits. He enjoyed the life quite well, making friends in his unit; but he still had headaches and periods of depression. There was, however, one man in the unit who did not like him and who baited him persistently. One evening this became too much for the patient, who saw red and hit him in the eye. A fight ensued, of which he remembered nothing. As no N.C.Os. were present no disciplinary action was taken. Since this affair he has been full of remorse. "He had an awful eye; it caused him great suffering, when there is already so much suffering." He brooded over this "sin." He was transferred to Brigade H.Q., but he did not like the change. He says that sugar and sausages were constantly being stolen, and he had to sit up to guard against this. He began to wonder whether there was any organized plot against him, for there were never any fatigue men to help him, the cooks were constantly being changed and so much work was thrown on him. He began to sleep badly, his depression increased and his headaches occurred daily.

Two or three months after the heavy bombing of Cardiff began he became extremely depressed. He felt that the bombing was his fault; that he had committed some sin, but he did not know what it was, otherwise he would have tried to expiate it. His insomnia became worse, and when he did sleep he had terrifying dreams. At night he lay in bed, while an unknown, unrecognizable voice spoke to him and told him he was to blame for all the suffering which was going on. His dead mother used to speak to him by day and night, telling him what to do. At night he would feel that someone was pulling his hair—"Look, you can see where it is coming out," he says, pointing to a normal head of hair. He has frequently considered suicide. Some years ago he drank a cup of disinfectant and he has been reconsidering doing this. He has some rather vague ideas of reference.

The intolerable burden of his unknown sin, the responsibility of sitting up at night to guard the rations, his insomnia and headaches, led to his being sent to hospital. On being admitted he was feeling depressed and was apathetic. He began thinking the other patients were talking about him.

Past history.—No previous illnesses, faints or fits, delusions or depression before the head injury.

Physical examination.—A depressed, anxious-looking man.

Central nervous system.—He is right-handed. Cranial nerves—N.A.D. There is moderate weakness of all movements of the right upper limb, and the tone is slightly increased. Some inco-ordination is brought out by the finger-nose-finger test. The left upper limb is normal, as

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are the lower limbs. Reflexes are all brisk and equal, and the plantar responses are flexor. There is a considerable degree of loss of postural sense in the right upper limb, and impairment of two point discrimination in the right hand.

Cardio-vascular system.—N.A.D. B.P. 135/85.

Mental examination.—He is in touch with his surroundings, and on good terms with the Sister and M.O., taking them into his confidence, but he has nothing to do with the other patients. There is great depression of activity; he shuffles round the ward slowly, and spends much time sitting still or lying on his bed doing nothing. He takes a long time to respond to questions, so long that one thinks he has forgotten them. During the interview he sits bolt upright in his chair with his hands on the arms, only moving to hunt through his pockets to show the M.O. letters and photographs of his family. He eats little, and has to be encouraged or he would eat nothing. His talk is limited in scope and vocabulary, and he speaks slowly. He is always depressed and looks abjectly miserable; at times he appears bewildered.

The EEG is abnormal. There are comparatively high voltage abnormally slow waves in the posterior parietal and occipital regions. These have a frequency of three a second. A high voltage three a second wave emanated from a point in the anterior parietal region on the right side. This single outburst, together with the character of several waves, is extremely suggestive of epilepsy.

In view of his confessed suicidal tendencies it was decided to transfer him to a mental hospital.

It will be noted that this patient, who came from epileptic stock, had fits; and that the first outburst of explosive rage occurred two years after the last fit. There was no record of the patient's previous personality apart from his account, but it seems that he had not had fits or faints, and he denied any previous depression. Whether the patient would have developed his present mental disorder without a head injury it is impossible to judge. One would tend to think that the form this disorder took depended on his constitutional make-up; that the head injury brought out trends which were already latent in his personality. The attacks of explosive rage might be the manifestation of a latent aggressiveness, or they could be epileptic equivalents.

This was the only case of our series who had typical epileptic fits, and one of the three cases which strongly suggested that the outbursts of rage might be a type of epileptic fit.

The next case also comes into this group.

CASE 5.—This guardsman, aged 26, had sustained a head injury while riding a bicycle in the black-out.

He had a retrograde amnesia of seconds and a post-traumatic amnesia of three days. On waking he had a slight headache, but it had gone a week before admission to this hospital. From the moment he first came round he had noticed a persistent queer musty smell. Since getting up he felt depressed.

Physical examination.—The only abnormal sign found was anosmia.

A radiogram showed bilateral diastasis of the lambdoid sutures.

For the past three weeks he has had the following attacks—he has about two every other day: He suddenly feels a terrible hate for somebody and wants to strangle them or hit them. When it comes on he sits down in order to stop himself carrying out the impulse. He then has a terrible conflict between two parts of himself; he sees it as though he is divided into two —one part sitting and entirely ruled by this impulse to be violent, the other part standing behind and to the right of the sitting part, telling him that this impulse is wrong and must be resisted. This split between the observing and observed parts of his personality is very vivid. It lasts, he thinks, about ten minutes. During the attack he feels "as strong as a lion," as though he could easily smash a chair or two; but the feeling is that he wants to tear people to pieces, not furniture. It ends with a throbbing sensation in his forehead synchronous with his pulse; then it is gone in a flash, leaving him with a feeling of relief, but feeling weak, depressed and apathetic. He is conscious enough of being in the explosive state to wander off into the garden so as to get away from people, but he is unable to tell anyone that he is having it. He has no knowledge of when an attack is going to come on, and it makes no difference whether he is occupied or not, or what time of day it is. He is convinced that one day it will be too much for him, and that he will injure somebody. Two other patients have observed him in an attack; one reported that he was very wild-looking, the other that he was frowning. The attacks have never been precipitated by any emotional stimulus, although he is more irritable than he used to be before the head injury.

His temper is always bad after them, and remains so for the rest of the day; but on other days he is more irritated by minor annoyances than he used to be. For example, the other day somebody said he had played a wrong card during a game; he could not speak, he was so furious; he was frightened that if he had answered him back it would have led to a fight. This fury lasted about ten minutes, but he continued to feel bad-tempered all the rest of the day.

Past history.—He is an only child. His father was a strict and religious Welshman, whom he respected and of whom he was frightened. He considers that his mother spoilt him. He says that he used to be very obstinate with his mother, but he did not dare be so with his father, who, he says, had a very bad temper. His father would flare up in a second over any little thing: he might be making a chair and something would go wrong; he would then smash the whole thing. He was always strict with him and forbidding.

He is very conscious of being a mother's boy, and spoilt, and therefore timid, and he blames his mother for this with some heat. On leaving school his mates used to go around in gangs,

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playing tricks on people, getting into trouble, and calling after and following girls. He would have liked to have joined them, but his father forbade it and he did not dare. At the time, owing partly to having to stay at home instead of being with the other lads, his worrying about his belief that other people would think he was a mammy's boy became acute, and he became antagonistic towards his mother; this was increased by his not daring to disobey his father, as he wished to. Finally, before the age of seventeen, he left home on account of a quarrel with his father. He came to London and joined the Guards, as he thought it would harden him and give him the discipline he needed.

Ever since joining the Army he has had attacks of depression, coming on usually in the afternoon. During these attacks he says that at first he wants to laugh or at any rate make some noise and then to cry. He then admitted with much blushing that at these times he thinks the other men are talking about him. He had never told anyone about this before. He is quite convinced that they are doing so, as he sees them stop and look at him and then go on with their conversation; he is quite unshakeable in this conviction. The kind of things they say about him are all to do with his being a coward, being frightened and timid and having no guts. He knows that they say "He is yellow; he's really a sap; he is frightened of everybody." As they do not come out into the open he is powerless to deal with them; but at these times he longs to fight them and show them that he is not frightened. During these attacks of paranoid depression he feels somewhere near as furious and violent as he does during the present attacks. But apart from these periods, he states that he used to be mild-tempered; he seems to have been moderately successful in keeping these feelings away from the rest of his life, whereas now he feels ready to fight people all the time. Being convinced that he was fundamentally a coward, unlike other men, he was always on the look-out for a fight to vindicate his honour in his own eyes. It was chiefly for this reason that he went in for hardening and discipline, although he did not like it. Similarly he has more than once refused promotion in the Army; he felt unworthy of it, and could not see himself ordering other men about and being above others.

He later related that at the age of thirteen he went through an obsessional period; its obvious feature was that he had to touch lamp-posts and telegraph poles, and avoid cracks in the pavement. This phase seems to have become latent before he joined the Army. On questioning, he states that he always takes a long time to come to any decision, has difficulty in making up his mind and that he never acts on impulse.

When asked whether he associated his present attacks more with the feelings of temper he would have liked to give vent to when he used to think the other men were talking about him, or with the conflicts he would have over his need to touch a telegraph post and his belief that he should not do such a stupid thing, he associated them more with the obsessions; the conflicting element in both seemed to him to be similar.

After discussion of his difficulties over a period of a month he became happier and less worried about himself; but there has been no shaking his conviction that the other men of his unit used to talk about him. He now noticed that since the accident he was not quite as good at figures as he used to be, and that he could not work out quite simple sums.

The EEG showed some slow waves with frequencies of 5 to 7 a second in the right parietal region towards the vertex. Elsewhere it was within normal limits. It was repeated one month later, and a similar record was obtained. Before he was discharged to duty it was repeated in association with the water pitressin test and with hyperventilation; but no clinical or EEG epileptic activity was brought out.

This case differs from the others already described in that the patient before the head injury had shown abnormal aggressive traits. It is true that he had never had attacks quite like these before, but he had had attacks of paranoid depression and he had shown some obsessional features. In addition to the attacks he was always ready to fight, although he and the pilot-officer of Case 2 were the only two of the series who were not actually violent towards others. There was no family history of epilepsy, and the patient had had no fits. There were features of these attacks which bring epileptic equivalents to mind; such as the suddenness of the onset of the attacks, without any obvious stimulus, occurring at any time of the day or night; the manner in which the attack passed off, accompanied by a throbbing in the forehead; the curious state of consciousness during the attacks, in which he knew he was having it but was unable to tell anyone so at the time, although afterwards he could relate the whole matter. It is also outstanding that in this case there was no environmental cause of the attacks, however slight; it is true that in the other cases the cause was, as Kaplan calls it, "trivial and impersonal," and would not pass as a cause in average people or in these people before their head injuries; but this patient's attacks would come regardless of the external environment, and regardless of whether the patient was occupied or not, alone or in company, at meals or in bed at night.

The following patient, who was sent into hospital on account of attacks of impulsive behaviour, came from an aggressive family, and had himself always had a violent temper.

Case 6.—This man, aged 32, fell off a ladder in October, 1941; he hit the ground with his right occipital region 10 ft. below. He was unconscious about five minutes. This accident was not followed by any immediate sequelae or headaches.

The following account was obtained from the patient by Major C. W. M. Whitty:

The patient was quite well until December, 1941, when he started having severe, throbbing, bi-frontal headaches. At about the same time he noticed he was becoming emotional and easily upset. He found himself crying at patriotic films, and was irritable and easily angered.

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He related that on three occasions he had become intensely angry about little things, and had behaved in an aggressive manner; he stated that he had no real memory of this behaviour. The following is an account of these three episodes:

(1) He became angry about an argument with a room-mate while dressing in his billet, and walked out into the street in his shirt and pants. Some of his friends brought him back with difficulty; he was aggressive and tried to resist. He does not remember walking out of the billet; he remembers being annoyed about something, then nothing more until he came round lying on his bed.

(2) While going into the mess at midday he got into an argument with a Sergeant. He remembers feeling very angry and "everything rushing to his head"; he came round some time later, and was told that he had attacked the sergeant.

(3) One month ago he became involved in an argument with his room-mates. He remembers being intensely angry, then nothing more until he came round sitting on his bed, feeling dazed. He was later told that he appeared dazed and had sat on the edge of the bed, complaining of dizziness for about a minute. Then he got up and started throwing his kit about; he smashed the window and hurled some of his kit through the frame.

Each of these episodes had been preceded by and followed by severe headaches.

Family history.—He states that his parents were quick tempered. To his knowledge there is nobody in his family who has ever had fits or been in a mental hospital.

Past history.—He says that he was nervous and shy as a child and used to keep to himself. He was always quick-tempered, and would quarrel with his sisters and mother. He remembers being punished for throwing things about when in a temper.

Mental examination.—He is rather restless, aggressive and sullen, and he appears anxious and apprehensive; in the ward he keeps to himself and sits by his bed all the time. He feels at times that people are talking about him and that his unit have got a down on him. He has no insight into these paranoid features, but is aware of his mood and behaviour changes. He is dull and backward.

Physical examination.—No abnormal physical signs.

Special investigations.—Radiogram of skull normal.

C.S.F. Pr. 140 mm. No block. Protein 30 mgm., 6 cells per c.mm. Water pitressin test negative.

This trivial head injury can have played no part in causing these outbursts of rage, which are obviously an integral part of his character. One supposes that this patient would have developed them had he had no head injury.

The next case, which was also observed by Major Whitty, always had an excessively aggressive personality.

CASE 7.—This patient, aged 27, was complaining of periods in which his mind went blank and in which he did not know what happened, but he had been told that he fought out.

He had taken up boxing seriously at the age of 14, at first as an amateur, later as a professional. During his boxing career he had received multiple head injuries. At 23 he gave it up on his doctor's advice; he was taking severe punishment at the time; he was counted out several times, but he states that he was never really knocked out. He had boxed three times in the year preceding admission, being knocked out in two of them. At the age of 19 someone cracked a bottle on his right mastoid region; he was unconscious seven days, in hospital 14 days, and then he discharged himself.

Five or six years ago, while working for a firm in Oxford Street, he had an argument with a customer; his mind went blank. He next remembered coming round feeling exhausted. He was told later that he had fought the customer.

Two similar episodes have occurred while in the Army. The last one occurred after an argument at a dance. He remembers turning round to see a man he had previously been arguing with, and then nothing more until he was entering his billet, a policeman asking him his name and number. He was told that he had hit out at the arguing civilian.

He states that he has suffered from periodic severe headaches, usually right-sided; these are accompanied by coloured spots and sparks dancing in front of his eyes, so that he cannot see properly. It is during these periods that he feels especially irritable, and it is usually then that he has one of these attacks; but he has had at least one without this migrainous attack. He states that his memory is not as good as it was, and that he is inclined to be depressed; when he is feeling depressed he is liable to get the attacks; then he cannot get on with anyone, and wants to be alone—"Boxing seems to be the only thing that eases me."

Family history.—He says that his father was always quick tempered; he was often knocked about by him, as were his siblings. After the age of fourteen he stood up for himself. His mother is not quick-tempered, but one sister is; she throws cups about, and is always arguing. There is a constant row in the family.

Past history.—He describes himself as always quick tempered. He left school in the top class, but has never kept to one job, as he was always sacked on account of fighting.

Physical examination.—No abnormal physical signs.

Special investigations.—Radiograms of skull normal.

C.S.F. Pr. 100 mm. No block. Protein 30 mgm., cells 2 per c.mm. Lange curve and W.R. negative.

Water pitressin test negative.

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Prominent in this case was a family history of violent temper; indeed the picture of the family environment as painted by the patient is reminiscent of the Duchess's kitchen in *Alice in Wonderland*. Taking into account this background and the fact that the patient had always been ready to fight and that he was a keen boxer, we are justified in assuming that this man had an excessively aggressive personality before his multiple head injuries. His attacks never came on without some cause, and according to the patient they only occur when he has migraine, although he did admit to one occurring without. His attacks of rage stopped quite suddenly; during the attack he would not be aware of being in this state, and he had no memory of it afterwards.

In the next case there is no evidence of an excessively aggressive previous personality; the head injury was followed by other changes in personality and by some intellectual deterioration.

CASE 8.—This sapper, aged 21, was admitted complaining of headaches.

Three months before, he had been knocked down by a car. He was still drowsy five days later—at the time the C.S.F. contained 60 mgm. of protein and 33 lymphocytes per c.mm.; there was a right lower facial weakness. A fortnight after the head injury he was still disorientated, but rational. The air encephalogram was normal six weeks after injury.

The patient states that three months after the head injury he suddenly got a desire to hit somebody or to smash something. Three weeks after the injury a nurse had come over to open a window near him; he rudely said she was not to do it; when she continued opening it, he knocked her down. Although this incident was witnessed, the patient denied knocking her down; he says he only argued with her.

While on leave three months later he was listening to a friendly argument between his mother and a neighbour; he nearly attacked the neighbour, but was prevented by his parent.

The patient says that at these times he feels in a terrific temper against the person; this lasts about an hour, and then stops like "the flick of the fingers." His mind keeps on saying "No, no," and it seems as though his chest and stomach are holding him back. He knows when he is having one of these rages, so that he could inform someone. He usually lies on his bed, closes his eyes, and does not listen to what is going on. He has two or three attacks a week, but he is usually able to control them without being violent. Once, he said, he had one in a shop; he had been to the cinema; he thinks there was no particular stimulus of the attack, except seeing the crowds in the shop; he says he threw his weight about, shouted so that the whole shop could hear him, made insulting remarks to the shop assistants, and was just about to smash the stall up when his mates took him off; he let himself be led away without a struggle.

He states that since the head injury he feels nervous all the time. He trembles if someone in authority talks to him, and if he has to do anything, particularly before the eyes of others, as he thinks he will not do it right. He is frightened of traffic, as he is terrified of being knocked down again. He feels he could not play football again or box. He has lost interest in reading, as he finds it hard to get the point of what he is reading; when eventually he does get the point, he loses it again in half an hour, so that he cannot take in the story. Since the head injury he has diminished libido; he finds that he cries easily, and he weeps all through films.

Previous personality.—He describes himself as having just an ordinary kind of temper before the head injury; as a child he was never rough; he says he was strong but not tough.

Mental examination.—He showed a good deal of intellectual impairment.

EEG normal.

There is no evidence in this case of a previous excessively aggressive personality, nor are the attacks at all like epileptic equivalents. Apart from these outbursts he is not irritable. He shows more intellectual defect resulting from the head injury than any other of our cases, and probably more changes in personality than the others, but Case 3 also showed marked changes in this respect.

A similar outburst in hospital brought the next case to our notice. He was a civilian, for whose notes we are grateful to Dr. Eric Gutmann and Mr. J. C. Scott.

CASE 9.—This young man, aged 19, had a motor-cycle accident five weeks before admission. For a fortnight he did not speak; when he began, he used baby talk, and only repeated a few words.

In the fifth week he pushed a nurse over in a fit of temper. A few days later he knocked a sister down and nearly succeeded in strangling her. After he was pulled off her, he cried and was most distressed at his behaviour; he kept on reproaching himself and called his victim a "hundred per cent. nurse."

Three months after the head injury he was still mildly euphoric and was still having sudden outbursts of temper. He showed some impairment of memory, and very marked disturbance of concentration and attention. At this time his retrograde amnesia was at least seven hours and his post-traumatic amnesia at least a week.

Special investigation.—A radiogram showed a large fissure in the right occipito-parietal region and a similar one in the right temporal region.

An air encephalogram showed some dilatation of the frontal horns.

The EEG showed an abnormal discharge from both frontal areas.

Five months after the accident the patient's condition was about the same. He was still very garrulous and his whole personality was coarsened. He had recently had an argument with his mother, lost his temper and kicked a chair across the room. He made childish mistakes in speaking; for example, he said "breaked" instead of "broke."

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Eleven months after the accident he showed some improvement. The people he was living with described him as "slightly quick-tempered," but there had been no outbursts of violence, and he seemed to have adjusted himself quite well to living in a community. He still made spelling mistakes, but his speech appeared normal. He scored 42 out of 60 in the Raven Matrices test, but he was not quite up to standard in the usual tests of learning and concentration.

This case was the only one of the series who was euphoric. He had obviously become childish since his head injury—a feature also shown by the next case. His intellectual impairment and personality deterioration were associated with cerebral change as shown by the air encephalogram and the abnormal electroencephalogram in the frontal lobe area.

CASE 10.—This guardsman had sustained a severe head injury, with a retrograde amnesia of 9 hours, and a post-traumatic amnesia of 14 days. When examined 4 months later there were no abnormal physical signs and the radiograms of the skull and electroencephalograms were normal.

Family history.—His father was depressed and usually bad-tempered.

Past history.—He had an unhappy childhood, which the patient attributes to his father's state of mental health. He ran away from home twice. He left school in Standard VI. He later gave up four jobs on account of having rows with the employer during his moods of depression. He joined the Guards at the age of 22, but he never liked the Army. A letter from his commanding officer, to whom he was batman, gave the man a very good character. Since childhood he has had very frequent bouts of depression associated with irritability lasting up to three days with no exogenous cause; they clear up suddenly and also apparently causelessly. During these periods the irritability may be so marked that he often has fights, and on one occasion he nearly strangled his wife. He has always been suspicious and never trusted anyone; has never had any intimate friends and has always preferred to be on his own.

Mental examination.—He is depressed and worried, restless and irritable, suspicious, and complaining of deterioration in his power of remembering. He is frightened of cars, air-raids, and any sudden noise. He is anxious about his mental condition, as he is getting into trouble on account of it. Soon after returning to his unit following accident, he was put on a charge for surliness; this was soon followed by another one for not obeying an order. When he went on leave he kept quarrelling with his wife. He said, weeping, "I don't want to do it; but I just can't help it. I had never quarrelled with my wife before."

While in hospital he would often be found on the verge of tears, and when repentant after one of his attacks of rage he would cry. His behaviour and appearance were slovenly, whereas his commanding officer described him as always very smart. He also said that he was always somewhat childish, but this feature had undoubtedly been increased since the head injury.

He had one of his outbursts about every ten days. He would gradually get more irritable and surly, until he had an outburst of rage. Then he would be most penitent. He remained friendly and helpful, although somewhat depressed and childish until the attack. For the night or two before the attack he would sleep badly. Then he might refuse to get up in the morning, and if pressed, be rude to the Sister and threaten her, using, as he once said, language which formerly he would not have used in front of his mates. In one of these he smashed all his crockery. The actual outburst needed a trigger to start it off; he was aware of this, and so would go and sit in a room alone, so as to avoid a fight.

There is no doubt that he has always been liable to moods of this sort, but the head injury has aggravated a pre-existent tendency, and converted what was an intermittent disorder into one that is now more or less continuous. The alteration in mood is severe, and of almost psychotic intensity.

In this case the head injury accentuates the basic tendencies of the subject's previous personality. This is a typical case, in that the mental disturbances caused by head injury are usually due to an accentuation of previous traits and tendencies; the subject has less control over them than before. The periodicity was a striking feature in this case; in fact, irritating circumstances which would be passed over in the few days after the outburst would lead to an attack during the irascible period; so that he reacts differently to the same stimulus at different periods. The attacks do not come on suddenly, but appear as the culmination of a period of bad temper and surliness; he is not at all excited during the outbreaks and shows no expansiveness, remaining essentially depressed until the attack is past, but this surly depression is a much milder syndrome than that of Case 4 or that of the next case.

CASE 11.—This patient, aged 27, was admitted to this hospital after five months' service in the army. His head injury had occurred in May, 1937, and was due to a car accident. He had a retrograde amnesia of three days and a post-traumatic amnesia of three weeks. On recovering consciousness he found his right arm and leg were very weak.

When he returned to work he was troubled by headaches, and started drinking gin to ease them; this led to his being sacked from his job on account of drunkenness. He then had several changes of job, and he could not settle down. His memory is definitely worse than before the head injury; he may go into a shop and have to leave, as he cannot remember what he went in for. If he tries to concentrate on a book or anything he gets a headache and his attention wanders. If he is reprimanded over anything he will brood over it for a long time. He states that he has been very much more irritable since the accident. He threw up one job in a fit of temper, telling the boss to put away his own bus if he was not satisfied with the way he did it. He admits that his marriage was not a success owing to his behaviour; he kept on losing his

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temper and telling his wife to clear out. He finally assaulted her on account of a rather vague suspicion that she was going out with his father; for this assault he received one year's imprisonment. He frequently used to attack his father, his wife, and his dogs.

He described himself before the accident as quiet and conscientious. He would be depressed at times for several days on end, especially when he felt the responsibilities of his work were too much for him; but he says he was cheerful on the whole, and he thinks that he did not show his depression much. He had periods of fairly heavy drinking, alternating with periods of relative abstinence, but he did not relate these to mood-swings. He denies any periods of elation. He admitted to always having been quick tempered, "but nothing came of it."

Mental examination.—His mood is described in his own words: "I'm just resigned to things, but I do not allow myself to brood." In hospital he showed explosive outbursts of violence, particularly on two occasions after he had managed to obtain some alcohol.

Physical examination.—The right pupil is larger than the left, both reacting normally. There is a slightly increased tone in the right limbs, and a slight tremor of the right arm; small movements are very clumsy on the right; all reflexes are increased on the right.

Radiogram of skull normal. Air encephalogram normal. His EEG showed scattered slow low-voltage waves in the right occipital region.

Progress notes.—On March 29, 1941, the following message was received from the Chief Constable, Halifax: "On the 19th of March he was brought before the Halifax Borough Court charged with unlawful wounding, and he was remanded for one week in custody, for mental observation and a medical examination. On the 21st of March he hanged himself."

The following case also came into collision with the law, on account of this symptom.

CASE 12.—The patient complained of headaches, dizziness, and outbursts of bad temper.

Five years ago he fell from a height of 20 ft., hitting his head on an iron girder while bricklaying. He had a retrograde amnesia of a few minutes, and a post-traumatic amnesia of three weeks, with islands after 24 hours.

He had no headaches, but felt a little dizzy when allowed up. After six months off work he tried to return to his former job of brick-laying, but he found that when he climbed a ladder, he felt faint and had to come down.

He loses his temper much more readily than he used to before his accident. Now the least little thing annoys him, such as someone shouting; but he also gets in a fury without any apparent reason. About five months ago he hit a policeman with whom he had just been having a friendly argument. About two months ago he lost his temper with the cook; he fought him and knocked him against a pot of boiling fat, which scalded them both. About ten weeks ago he saw some soldiers fighting in the street and so he joined in and knocked one of them out.

He has had these impulses to attack people only since his head injury. His mother states that he is a completely changed character.

Raven Matrix test: 23 out of 60—mental age of 12. Physical examination: B.P. 160/90. Bilateral ptosis—probably congenital. EEG normal.

DISCUSSION.

After reading the notes of the above cases, it is clear that they do not form a homogeneous group. There was no particular type of case which, following head injury, would be liable to develop this symptom. While it is obvious that injuries of similar severity do not cause the same mental effects, it could not be shown in all cases that the subjects who developed this symptom had a predisposition towards it, and that they had lost some of their self-control owing to the head injury. This may be due to insufficient information about their personalities; but three of the series (Cases 2, 8 and 9) had never shown any evidence before of being excessively aggressive; and we have seen a case—not included in this series, as he exhibited no explosive rage—who showed, during the period of unconsciousness and uncontrolled behaviour, great affability, charming good manners, friendliness and a tendency to joke; but when he had left the period of amnesia and had become rational, he was very irritable, excessively aggressive, boorish, and always ready to snap at his friends; his uncontrolled personality was quiet and friendly, but his "normal" post-traumatic personality was abnormally aggressive. That this symptom is sometimes due to a general loss of control of giving vent to emotion is shown in some of these cases by an equivalent loss of self-control in other ways; most conspicuous is a tendency to dissolve into tears. Of two cases with excessive manifestation of aggression before injury, Case 6 complained that he had noticed himself becoming emotional and crying at the cinema; Case 10 was unable to talk about his outbursts of rage towards his wife without weeping; after each outburst he would weep with shame, and often on other occasions he would be found in tears. Four of these twelve cases showed obviously aggressive personalities before head injury (5, 6, 7, 10); three did not (2, 8, 9); in the rest there was insufficient information on which to base an opinion. Case 5 had always been irritable during

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the attacks of paranoid depression, and had wanted to fight his imagined persecutors and had always been pugnacious. Case 6 described himself as always quick-tempered, and related many episodes from his childhood of being punished for throwing things about when in one of his rages. Case 7 had been a boxer since the age of fourteen. Case 10 had always had moods of agitated depression associated with irritability, which were apparently endogenous. On the other hand, Case 2 was said by his wife to be always cheerful and never irritable; she had never seen him in a temper before; this opinion was confirmed by his colleagues. Case 8 stated that he had had an ordinary kind of temper before the head injury; he had never been rough, and had never really lost his temper before the injury. Case 9, according to his parents, had always been easy-going and cheerful, and had never shown outbursts of temper.

This symptom is not necessarily the culmination of a phase of irritability; not all cases were irritable. Case 1 was always cheerful and ready to amuse; Case 7 was cyclothymic, having the attacks only during the depressive phase; Case 8 was calm and apathetic; Case 9 was childish, cheerful and euphoric. In nine of the series some stimulus, however slight, was needed to start off the attacks; in one case the stimulus was merely the emotions aroused on seeing the crowds in a shop. But in three (1, 5 and 9) the attack was unrelated to the external environment. In Cases 3 and 10 the outburst of rage would occur at the height of a period of depression; at this time a stimulus would set off an attack which at any other time would pass unnoticed.

Half of these cases were depressed; in some this symptom itself was apparently a main cause of the depression; the patients were horrified at their lack of self-control and were alarmed at the possible legal consequences, and they were frightened that they were becoming insane.

Seven of the series showed intellectual deterioration, four showed none. One case only (9) was euphoric.

Six cases had normal electroencephalograms, six had abnormal ones; but there was no localizing site of abnormality or type of encephalogram common to this type of case.

Not all these cases had had very severe head injuries; Case 3, for example, who came to hospital on account of this symptom, had a P.T.A. of only a few hours, and Case 4 had a P.T.A. of 24 hours. In Case 6 the head injury could have had only a very minor precipitating effect in causing explosive rage, if indeed it had any. But the average length of P.T.A. was seven days, indicating that these were severe cases; in seven cases it exceeded a week and in four two weeks.

The relation of this symptom to epilepsy is raised by Cases 1, 4 and 5. These cases had shorter P.T.A.s than the average of the series, the longest P.T.A. being two and a half days. In Case 1 the attacks always occurred in the same form, which the patient himself described as " something like a fit." Suddenly he would get a feeling of apprehension and restlessness, without an environmental cause; this was followed by an hallucination accompanied by a feeling of great terror or dread, defying description. Then came the explosive rage, with a peculiar sensation in the left side of the head. There was an amnesia for this time, during which he would perform actions typical of epileptic automatism. As the attack went off he would have a vague auditory hallucination. The EEG was typical of epilepsy. Case 4 was the only one of the series having typical epileptic fits; two years after his last fit he had the first attack of explosive rage; here there was a family history of epilepsy. In Case 5 epileptic equivalents were suggested by the suddenness of the onset of the attacks coming out of the blue, and the attacks going off after ten minutes with a throbbing sensation in the forehead synchronous with his pulse. The attacks would leave this patient irritable and bad-tempered, incidentally, unlike Case 10, whose irritability would be relieved by the outburst. Cases 1 and 4 had EEGs supporting this diagnosis; the EEG of Case 5 a few months after the injury was normal. But this case does not fall so readily into the epileptic group as the two others. In these three cases the attacks would come on without any environmental cause or provocation. With the possible exception of Case 5 we regard these cases as epileptic, and the outbursts of rage as a manifestation of " sudden excessive rapid discharges of grey matter " to quote the words of Hughlings Jackson. Case 5 showed the typical features of a compulsion neurosis; but the sudden onset of the attacks was unlike the usual dilemma of an obsession, although

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most obsessional conflicts are based on aggression; the patient himself thought that the attacks were more nearly related to his earlier touching compulsions than to his periods of paranoid depression.

Only two of our cases (2 and 5) did not have to be restrained from hitting people; in Case 2 the outbursts were never so severe that any violence was shown; the patient merely shouted and became very agitated; in Case 5 the patient had an intense conflict in his mind, but to outward appearances nothing was ever noticed except that he wandered off with a wild look. In this case and in Case 10, during the attack the patient's personality retained an observing factor in consciousness, so that he was not totally involved in the rage; in the other ten cases there was no room in consciousness for any emotion or thought except rage, so that the subject was quite uncontrolled and made no attempt to control the emotion.

From a forensic point of view these people may well be considered as persons who are insane at the time of the attack. An act of violence committed during epileptic automatism is not considered punishable, as the epileptic is considered unmindful during that time of the consequences of his acts; certainly the same must be said for these cases which suggested epilepsy. For it is thought that the pathological state of the brain causes the violent act, and not the subject, and that without this pathological state the subject would have acted otherwise. But it must not be assumed that in all cases of epilepsy the subject is powerless to resist the attack. The phenomenon of an epileptic being able to avert a Jacksonian attack in various ways has been well known to mankind since the time of the ancient Greeks. Penfield (1938) has shown that during electrical stimulation of the cerebral cortex on conscious subjects "the demand of an electrode is not always irresistible." Although stimulation of area 4 or 6 of Brodmann produces a movement which the patient cannot inhibit, stimulation of the brain of an epileptic patient at a distance from the motor cortex sometimes produces what he describes as a desire to move a certain part. By making a conscious effort he can prevent such movement." But even allowing for this possible power of inhibition, the fact remains that the epileptic, owing to his cerebral disorder, has these impulses which normal people do not have. At the time of the attack he is considered insane and unable to distinguish right from wrong.

But the epileptic exhibits abnormal behaviour not only at the time of the attack; and this behaviour is typical of epilepsy, and, it would seem, due to the epileptic diathesis. Ribot (1896) characterized the epileptic personality as follows: "Even in periods of calm, the universally noted psychological traits reveal a sombre, morose, irritable, but above all, irascible disposition." From electroencephalographic studies we now know that epileptics usually have subclinical attacks, and that the epileptic "in periods of calm" may show an electroencephalogram that is pathognomonic of his disorder. The difference between the electroencephalogram of the epileptic at rest and the epileptic during a convulsion is one of degree; all intermediate stages between the two electroencephalograms can be found. From the clinical point of view, too, it is doubtful if a line can be drawn between the state of epileptic furor and that of the epileptic equivalent; and, as we have seen, it is rather arbitrary whether one places epileptics with explosive rage in one category or the other. Norwood East (1926) states: "There would seem to be no doubt that epileptic furor may result in crime which is remembered when the epileptic has become his ordinary self. . . . My own experience is that the epileptic act of automatism is not remembered, and I derive support in this from the views of Savage, Maudsley, Mercier, Pietersen, Jelliffe and White." But we consider that too much weight should not be given to this question of amnesia. During epileptic twilight states the subject may be aware that he is in an abnormal state of consciousness, and he may remember afterwards full details of that state, including his feelings. He can be given poetry to learn during this state, and he may be able to reproduce it when he has returned to his usual state of consciousness. The psychological processes of registration and retention continue normally in many cases of so-called "organic" amnesia; the disorder is usually in recall; this disorder is also the only one in hysterical amnesia. Confirmation of this can be had by obtaining the forgotten material under hypnosis or barbiturate hypnosis in cases of head injury, metrazol or electrical convulsions, or Korsakow's psychosis. In hysterical amnesia the happenings during a state of automatism may be unobtainable by any means, or they may be reproduced under hypnosis; and in

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epileptic automatism the same applies. Just like the irascible mood of the epileptic, the twilight state may go on for days. Bleuler (1937) describes the affect of the two conditions as follows: "Particularly common are the epileptic equivalents associated with anxiety or rage, which may lead to brutal acts of violence towards himself or others. . . . Also the moods . . . of which the irascible are the most notorious; in these the patient is irritated by everything that occurs and behaves in such an aggressive manner that conflicts are unavoidable." It seems, then, that if the epileptic is considered not responsible for his actions at the time of the attack on account of the pathological state of his cerebration, he should have a good case for showing that for the same reason he is not responsible at other times either. The question whether the patient would have committed the act of violence had he not had an epileptic fit is surely insufficient; it would seem necessary to ask, would the patient have committed the act had he not been an epileptic? The man's make-up itself might then be considered adequate excuse for his criminal act.

If epileptics can escape responsibility for their acts in this way, then the man suffering from a traumatic cerebral lesion should doubtless come into the same category.

If he shows personality changes, lack of emotional control, or intellectual loss, he should have no difficulty in convincing a jury that at the time of a possible assault he should be considered insane and incapable of distinguishing right from wrong. But a man who was known to have had previously a markedly aggressive personality would have more difficulty. Four of our series would certainly come into this group. These cases would be hard put to it to show that the attacks of explosive rage were due to cerebral damage. But if the attacks are not due to cerebral damage, they are symptomatic of a pathological mental condition; it can reasonably be argued that any person exhibiting this symptom is not of sound mind at the time of committing the act, and that this unsoundness of mind overrides reason and judgment, obliterating the sense of right and wrong. For it would be invidious to declare that epileptic cerebration is exempt from the censure of the law, whereas other pathological processes causing the same results are not accorded the same privileges.

The disposal of our cases shows that the prognosis regarding these patients becoming useful members of the community is bad. Four had to be invalided from the Army; one was returned to light duty for home service only: one had to be sent to a mental hospital; one later committed suicide in prison, where he was detained on account of wounding with violence; one was sent to a neurosis centre, whence he was boarded out of the Army; three were returned to full duty as A1; one, a civilian, took a few months before he returned to work, and then he was still liable to fits of temper.

SUMMARY.

Twelve cases of head injury suffering from attacks of explosive rage are described. The relation of this symptom to various recognized disease entities and its forensic implications are discussed.

Owing to their military duties in different parts of the world, one of the authors was unable to see the later stages of this paper; therefore he (J. M. McGregor) is not responsible for the discussion or the views expressed.

We would like to acknowledge our gratitude to Wing-Cmdr. Denis Williams, who interpreted the EEGs; to Air-Vice-Marshal C. P. Symonds for advice and criticism; to Major C. W. M. Whitty, Dr. Eric Guttman and Mr. J. C. Scott, and the staff of the Military Hospital (Head Injuries) and the Medical Research Council for the use of notes on their cases; and to Lt.-Col. Chambers, *M.C.*, for permission to publish this paper.

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THE IMPULSIVE PSYCHOPATH: A CLINICAL AND ELECTRO-PHYSIOLOGICAL STUDY.

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This paper should be considered a preliminary communication, tentative and suggestive. It is based on a psychiatric and electro-physiological study of 70 cases (children, adolescents and adults) referred for anti-social and/or criminal behaviour, and is an attempt to suggest more defined criteria for the assessment of a particular syndrome.

Discussion of the psychopathic personality has been hampered by lack of clear definition of the condition. Curran and Mallinson (1944) list a dozen attempts at definition and a dozen attempts at classification based on the study of conduct. Some agreement is found between four authors that the psychopath is liable to episodic impulsive acts, and is moreover unable to profit by experience.

Research into aetiology reveals a consensus of opinion in favour of a constitutional origin, and Slater (1938 and 1943) states that " with few exceptions, however, the psychopathic personality is the result of the combination of hereditarily determined tendencies." Electro-encephalographic studies by Lennox, Gibbs and Gibbs (1940), Williams (1941), Gallagher, Gibbs and Gibbs (1942), and Hill and Watterson (1942) offer contributory evidence of the constitutional origin of the psychopathic personality, while Hill and Watterson find that 68 per cent. of the group described as aggressive psychopaths show an abnormal EEG.

Brill and Seidemann (1941) found a diminishing incidence of slow rhythms with advancing adolescence. Secunda and Finley (1942) found abnormal EEGs more common amongst " problem " than amongst normal children; but the cases of behaviour disorder showed abnormal EEGs with diminishing frequency as they grew older. In the 4 to 9 years group the frequency of abnormal EEGs was 74 per cent., and of the 16 to 18 year group 34 per cent. Grey Walter and Dovey (1943) in a group of 1,000 unselected mixed cases found (except in cases of cerebral tumour) " a smooth decline in percentage abnormality with increasing age," and confirmed that very slow rhythms (at 0·5 to 4 c.p.s.) begin to fade at the 4 to 7 years age group, and the dominant rhythm is at 4 to 7 c.p.s. from the temporo-parietal cortex.

This rhythm, called by Grey Walter the " theta " rhythm, tends to mask the 8 to 12 c.p.s. " alpha " rhythm, but the latter is always present in appropriate physiological and psychological surroundings; and as with advancing years the 4 to 7 c.p.s. fades, the alpha rhythm is left clearly dominant.

It is found that theta (4 to 7 c.p.s. rhythm) appears in cases of thalamic tumour when the cortex is cut off from the basal ganglia, in cases of children exhibiting aggressive behaviour (e.g. temper tantrums and the like), and in cases of aggressive psychopathic state.

It is perhaps pertinent to consider for a moment the psychological implication of the word " aggression." It is used here in the sense of " drive " derived from instinctive levels, which may be directed outwards against the external environment, or inwards against the self. Hence it is non-specific in its application except in so far as the magnitude of the intensity and directional factors render it pathological in any given person.

In this connection one observes that Henderson (1944), writing in *English Studies in Criminal Science*, vol. ii, considers only the " predominantly aggressive " and " predominantly passive " or " inadequate " psychopath, and instances murder

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and suicide as a logical extension of activity of the respective groups. He makes the statement that " the object is different but the underlying principle the same; murder and suicide are similar twins."

Before going further with this attempt to relate the neurological and psychiatric implications of this study, it is perhaps pertinent to consider other observations which may indicate neuronic dysfunction. Silverman (1943), in a study of 75 criminal psychopaths, in which he merely groups the electro-encephalographic findings into " normal," " border-line abnormal " and " abnormal," finds evidence of a cerebral lesion in the histories of 27 cases, and observed neurologic signs in 21. The highest pathological factors in the histories were dystocia, birth-trauma and head injury, and in the neurological signs, inequality of deep reflexes, questionable pathological reflexes (Hoffmann, Babinski, etc.), and severe tremor.

In the writer's series of 70 psychopaths, 50 cases were studied for neurological signs, and 38 (i.e. 76 per cent.) were found to show a sign which in its full implications will be the subject of a further communication. Briefly it consists in a " flickering " movement of the fingers, observed when the arms and hands are extended and the eyes closed. It appears to be more commonly lateralized to the left side, is commonly accompanied by an equivocal plantar response on the same side and is increased by hyperpnoea, following which the " flicker " may appear in the digits of both hands. The movement of the fingers is non-phasic, not athetoid, or choreiform, and is probably best described as a " digital asynergia." The question of " sidedness " has been discussed by Fleischhacker (1943), and he makes the tentative suggestion that " one begins to wonder whether the right hemisphere in " right-handed " people may not play a more important role in the production of some " psychotic " symptoms than is generally thought." In a control group of 52 persons, age range 8 to 65 years, five only (i.e. 9·59 per cent.) showed this sign. Before leaving the subject of cerebral pathology in relation to psychopathic states it should be mentioned that several workers (reported in Curran and Mallinson's review) discussed cerebral changes, and it is perhaps noteworthy that Prof. R. J. A. Berry, addressing the Royal Society of Edinburgh, appears to favour the conception of establishment of engraphic patterns based on the theory of neuronic cerebration. He points out that " between birth and the age of six years the brain approximately quintuples in size and weight, and between birth and maturity it adds to its weight by roughly 1,000 gm. Most, if not all, of this increment is due to the myelinization of the cerebral axones of the white medullary centres." Prof. Berry found that " the smallest averages within normal range were shown by the shiftless and thriftless, criminals and reformatory boys."

Mention above of hyperpnoea leads on to discussion of the effect on the psychopath of biochemical stress, as estimated psychiatrically and by electro-encephalography. Hill and Watterson state that three factors are known to influence rhythms: biochemical changes in the blood, cerebral trauma and constitutional defects. Examples of biochemical stresses which have been applied to such cases are the lowering of blood sugar by fasting and/or the injection of insulin and hydration. If either of these are done to a psychopath, hyperpnoea then augments the 4 to 7 c.p.s. theta rhythms, and slower delta-type rhythms appear at a much earlier point than in the normal. Hill and Sargant (1943) reported a case of the first-mentioned of these, in a youth charged with the murder of his mother. Here the EEG became abnormal when the blood sugar fell below 100 mgm. per cent., and the appearance of slow rhythms was accompanied by some degree of impairment of judgment and clouding of consciousness (quoted by Curran and Mallinson).

In the writer's series two cases have been investigated in this manner. In May, 1943, Miss A—, aged 17 years 8 months, was charged with " grievous bodily wounding." It was stated that at about 2 a.m. she rose from bed, took down a horse-shoe (which apparently formed some part of her bedroom furniture) from the wall, descended to the floor below, and inflicted severe head injuries on a woman asleep there. During the subsequent three weeks, in spite of thorough investigation by the C.I.D., she denied all knowledge of the crime, and amongst her usual daily activities, sat for, and passed, a minor examination. Her early history suggested the presence of an epileptic inheritance, and showed that she had previously reacted to frustration with episodes of sullen aggression.

On examination after arrest she showed a bland indifference, with marked block of affect, both to the social significance of her act and its consequences. Her intelligence estimation put her in the dull and backward group; and psychological tests (e.g. Rorschach) confirmed the view of emotional and intellectual dissociation.

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EEG records were taken, using a 4-channel machine, with standard and bi-polar leads, and Grey Walter's frequency analyser.

Resting records showed a peak at 7 c.p.s.; fasting records with a blood sugar of 84 mgm. per cent. showed increased energy in the 7 c.p.s. band, with bursts of lower frequencies.

Hyper-ventilation elicited a regular bifrontal 2 to 3 c.p.s. rhythm.

Repetition of records 20 minutes after the ingestion of 50 gm. of glucose showed the same features.

Conditions under which the accused had lived during the 24 hours prior to committing the crime were imitated as closely as possible, and blood-sugar estimations were taken approximately hourly through that time. At 2 a.m. the blood sugar had fallen to 69 mgm. per cent. On this it was considered a reasonable inference that the EEG, abnormal at 84 mgm. per cent. blood sugar, would be at least as abnormal, if not more so, at 69 mgm. per cent.

This evidence was accepted by the learned Judge, who bound over the accused with a condition of residence, and weekly attendance at a Mental Treatment Clinic.

It is perhaps interesting that after a year of this regime Miss A— voluntarily entered a mental hospital, where she has remained and is apparently content to do so.

Mr. B—, aged 18 years 8 months, was examined in February, 1943, charged with breaking, entering and larceny. There was again a family history of epilepsy, and a personal history of recurrent outbursts of rage and violence, with previous convictions for house-breaking and larceny or which he had been sent to a Nautical School (from which he had absconded on several occasions). He also showed a bland indifference to his state.

His records showed a peak of energy in the 7 c.p.s. band, which became dominant after hyperpnoea.

As the Court desired a recommendation as to disposal, they were urged to make the detention maximal. He was committed to Borstal, and released after 10 months. In July, 1944, he was arrested for murder, and this time was examined by Dr. Denis Hill, who reported the presence of asymmetry of cortical rhythm, the presence of diffuse theta rhythm, instability to overbreathing which was not inhibited by raising the blood sugar above 150 mgm. per cent., and undue instability to lowering of blood sugar.

The sentence was 15 years' imprisonment.

On the same day in 1943 another case was examined, remanded on a similar charge, who showed a similar record. His future activities may be awaited with some interest.

Three other cases in this group: Private C—, aged 19, was examined while awaiting trial for a peculiarly unpleasant murder, apparently unpremeditated. His records showed an intermittent low potential 4 to 7 c.p.s. rhythm, at times dominant from the temporal area, and at times in short bursts from first one and then the other frontal lobe. There was a definite asymmetry of the alpha rhythm; hyperpnoea had no appreciable effect on these rhythms, nor had the ingestion of glucose.

This man's autonomic activity was studied with the aid of the electro-pathometer, which makes use of the psycho-galvanometric reflex by a modification, designed by Grey Walter, which permits of a constant current input and (D.C.) amplification of the voltage drop across the patient, which is proportional to his resistance.

No objective signs of emotion relating to the crime could be obtained; and there appeared to be a dissociation of affect amounting to abulia.

Fifteen previous convictions for assault and/or assault with robbery had been recorded against this man, his first conviction being recorded at the age of 12 years.

Mr. D—, aged 16, showed a similar record. While on remand for larceny he committed an unprovoked assault on another boy, which was fortunate not to have produced more than a transient concussion.

Examined with the electro-pathometer there was found an almost complete absence of affective change; though, as in the previous case, the subject freely discussed anti-social activities in the past, many of which had not figured on any charge-sheet.

This electro-pathometric study is being continued.

Mr. E—, aged 22, had a history of head injury at the age of about 11 years, and in 1938, and a minor injury again in 1940 while on active service. About 10 days later he had an explosion of temper which was repeated on several occasions, and earned him various periods of detention. He then began stealing bicycles, motor-cycles and cars, receiving in all nine sentences, civil or military, in 17 months. At an earlier examination than that performed in March, 1943, he was reported to have shown diminished deep reflexes on the right side, and an equivocal right plantar response.

In March, 1944, he was referred for examination; the electro-encephalogram showed marked asymmetry of the two post-central hemispheres; on the left side analysis showed peaks at 3, 5, 7, 8, 10 and 12 c.p.s., the rhythms at 10 and 12 c.p.s. presumably being the alpha rhythm, as they were partly blocked by physical and mental stimuli. On the right side the dominant rhythm was at 8 c.p.s. with irregular modulations. The alpha rhythm appeared to be absent on this side. Overbreathing greatly augmented the energies in the slow band, producing some activity at 2 to 3 c.p.s. and 5 to 7 c.p.s. from the right post-central hemisphere.

It was considered that this record suggested some degree of cortical atrophy in that area rather than an essential condition.

A Rorschach examination, by Dr. Hutton, showed extreme restriction of interest, and of

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normal emotional reactions. Air-studies by Mr. Phillip Ryan, F.R.C.S., suggested a filling defect in the left parietal area. A trephine disc was removed from the left parietal area, and an Adson dura separator passed between dura and brain resulted in the escape of clear fluid in some quantity, and the lessening of tension.

The patient made an uninterrupted recovery; he has remained at work for the past ten months, and there have been no further anti-social episodes.

An EEG record taken last week, i.e. January, 1945, showed a normal record.

Of the 70 subjects examined for this study, 29 (i.e. 41·42 per cent.) showed a persistent theta (4 to 7 c.p.s.) rhythm; an additional 5 showed a resting delta (0·5 to 4 c.p.s.) rhythm (i.e. 48·57 per cent.); and a further 20 showed, with a normal resting record, delta rhythms developing after hyperpnoea. In the case of 7 of the 10 subjects showing normal records there is a possible explanation. One was a postman, previously of good character, committed for larceny of registered letters; another was a furrier on a first charge of larceny of a fur coat left in his care for repairs. It is possible that the aggressive episodes in both these cases were reactions to police arrest.

The third was a girl, charged with larceny, who appeared for examination with an hysterical palsy of the left arm. It is possible that her so-called fits of aggression were hysterical (or to quote R. D. Gillespie, "histrionic") in nature.

The fourth proved to be an hallucinated schizophrene with a paranoid overlay. Examined in 1943, he was treated with electro-convulsion therapy, and, at the time of writing, remains well and in regular employment.

The fifth was a small boy with an I.Q. of 140, who was being educated in a village school. His aggressive episodes, when closely investigated, proved to be the reasonable reaction of an intelligent child to a dull and repressive external environment.

The sixth proved to be a mental defective with a schizophrenic overlay, and the last was an infanticide who reacted vigorously to arrest. Her previous record had been good.

It is possible that these cases cannot be called true psychopathic personalities.

Lest it be thought that the interpretation of records is a simple matter this idea should be dispelled forthwith. Two records exemplify this point, and perhaps emphasize Dr. Denis Hill's criticism that the time has arrived for an exhaustive study of the individual record, rather than repeated statistical surveys of many records.

The first is the case of Private C—, whose history has already been given; the second was that of an intelligent schoolmaster, undergoing considerable emotional stress due to conflict, whose basis was the old story of "the eternal triangle." An acute near-schizophrenic episode occurred lasting four days, with disorientation in time and space, and some paranoid features. During this time his records showed alpha frequencies, appearing irregularly in either and both pre-central hemispheres. A month later, when he had solved his conflict by direct action, the record was normal and has remained so.

What can be the possible interpretation of the findings set forth above?

Alpers (1940), quoted by Curran and Mallinson, reports that, in cases of hypothalamic destruction or dysfunction, due to tumour, customary personality trends are disordered, with, amongst others, obvious anti-social tendencies and partial or complete loss of insight into these changes. Grey Walter (1945) considers that the appearance of theta rhythms indicates disturbance of thalamic-hypothalamic function.

Masserman (*Behaviour and Neurosis*, University of Chicago Press) points out that Alpers in conclusion specifically states, "the hypothalamus may be regarded as an area concerned with the expression of emotional reactions which are ordinarily sifted and weighed by the cerebral cortex," and himself suggests that "an emotion is a highly integrated conative, cognitive and affective-somatic reaction, in which not only the central nervous system but the entire organism functions as a psychobiologic whole."

It is here suggested that we are observing a condition where the normal establishment of cortico-thalamic association patterns is arrested at the age in childhood corresponding to the end of the latency and the beginning of homosexual periods. If this be so, how might the process be effected? Darrow and his co-workers (1944) in a study of parasympathetic regulation of the EEG suggest that a neural

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mechanism is indicated by which emotionally induced autonomic changes may produce " functional " effects on brain.

If the foregoing suggestions be valid, some indications for the treatment of this condition may be afforded. Taking the long-term view treatment must surely be preventive, and attention might well be directed to the maturational period mentioned above. Hence another burden falls on the shoulders of the child psychiatrist.

Taking the short-term view, it might be advisable to advocate the introduction of an indeterminate detention sentence, discharge to be dependent upon the establishment of satisfactory social and ethical patterns. This view has been advanced by Prof. D. K. Henderson, and might go some way to dispel the popular idea that the psychiatrist invariably appears in Court to offer evidence in mitigation.

Finally, one suggests that the hitherto loose conception of psychopathic personality is beginning to take shape, and that a more precise understanding of the condition is emerging.

I desire to thank Dr. J. F. Davidson, M.O.H. for Somerset, for the use of much case material; Prof. F. L. Golla for his unfailing help and encouragement; and my colleagues, Mr. Grey Walter and Miss Vivien Dovey, for their ungrudging co-operation.

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THE PSYCHONEUROTIC SPECTRUM AND DUAL DIAGNOSIS.

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EXCEPTING hysteria, there is a wide divergence of opinion about the proportionate incidence of the various psychoneurotic syndromes. This is more extraordinary because there is general acceptance of the meaning of current terms. Thus, very roughly, in the sense of abnormality—

1. Anxiety stands for excessive and over-persistent apprehension, in relation to known causes.

2. Hysteria is the conversion of psychological protest or rejection into terms of physical illness.

3. Obsession and compulsion represent distressing preoccupation with rituals or constantly repeated thoughts or actions, with insight and self-criticism.

4. Psychopathy refers to asocial attitudes, gross inadequacy, failure of adaptation, or eccentric conduct in the presence of normal intelligence and without insanity.

5. Depression signifies generalized despair and loss of zest, with reduced activity and self-abasement, mania its opposite.

The degree to which the symptoms in each group are reinforced by unconscious mechanisms is very much a matter of opinion.

As a rule each diagnostician can find evidence to satisfy himself that he is applying correct labels. My own diagnostic percentages are shown in Table I. The patients considered were 150 non-commissioned ground personnel admitted successively to a Royal Air Force hospital for male psychoneuroses, and 250 successive male psychoneurotics seen at an R.A.F. neuro-psychiatric centre, including about 25 per cent. of officers. Fifty per cent. of anxiety and depression cases were officers, compared with 35 per cent. of obsessionals and 10 per cent. of hysterics and psychopaths. The average age of hospital patients was a little under 30 years, and the majority were between 25 and 30. The " clinic " patients averaged something over 30 years, and the largest group was from 30 to 35.

TABLE I.

	Hospital.		Clinic.	
	Number.	%.	Number.	%.
Anxiety state	62	41	75	30
Anxiety with hysterical symptoms	16	11	20	8
Hysteria	24	16	87	35
Depression	22	15	23	9
Psychopathic personality	18	12	27	11
Obsessive-compulsive psychoneurosis	8	5	18	7
Totals	150	100	250	100

The inclusion of anxiety with hysterical symptoms was made necessary by the impossibility of favouring one diagnosis rather than another in these cases. I found no necessity to increase these divisions. Excluding the anxiety-hysteria group, additional symptoms were present as shown in Table II, the figures being given to the nearest five to avoid any impression of absolute exactitude.

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TABLE II.

Additional symptoms.	Clinical diagnoses. Anxiety state. %	Obsessional states. %	Depression. %	Hysteria. %	Psychopathic constitution. %
Anxious	(100)	15	25	25	25
Obsessional	5	(100)	25	5	15
Depressive	15	45	(100)	20	25
Hysterical	10	5	20	(100)	25
Psychopathic*	20	20	15	15	(100)
Schizoid	5	5	5	5	35
Hypochondriacal	0	0	10	5	10
Fatigue†	10	15	25	15	20

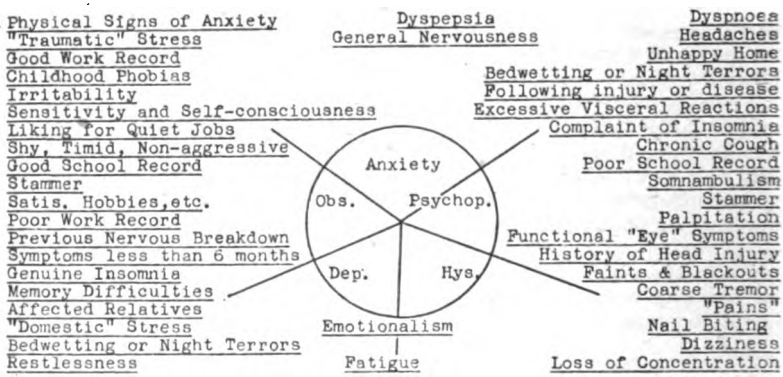
* Psychopathic history.

† Most hysterics, many psychopaths and some anxiety states in this row might be diagnosed "effort syndrone" by many, up to 15 per cent. of all cases. With different points of view it is not hard to see that others might have given any figures up to or even over 30 per cent. for psychopaths and 20 per cent. for hypochondriasis, or reduced the two percentages almost to *nil*.

History and Symptomatology.

Symptoms and signs specific to the diagnostic headings, such as anxiety and hysterical paralysis, need not be considered here.

A history or present complaint of faints or blackouts appears in hysteria in 45 per cent. of cases and 15 per cent. mentioned somnambulism, each strongly suggesting a diagnosis, as they were uncommon in other groups, least common in obsessive-compulsive neurosis, less than 5 per cent. combined. A history of excessive visceral reaction to minor ordeals is considerably commoner—30 per cent.—in hysteria than in other reactions—less than 15 per cent.; a very coarse tremor is



almost pathognomonic of hysterical reaction, 15 per cent. A reaction precipitated by an acute traumatic experience is most often anxiety state—25 per cent. compared with less than 10 per cent. in other reactions—and genuine dyspepsia occurred in 35 per cent. of anxiety reactions compared with less than 10 per cent. in other types. Real "domestic" stress was very common in depressive reactions.

By and large, however, traits and symptoms are surprisingly widespread, and differences in incidence are small; nevertheless it is possible to arrange them in a way which shows in which diagnostic compartments they are rather more likely to be found. Since such traits and symptoms are usually multiple, the arrangement gives an ill-defined picture of the non-specific accompaniment of the various psychoneuroses.

The diagram shows such a spectrum. It lists a motley collection of traits, stresses, symptoms, and signs, including some favourable points. The circular representation helps, but it is doubtful if even a spherical model could approach final accuracy. Stammer has had to appear twice, and bedwetting and sleep disturbances, such as night terrors or restlessness, have been combined and duplicated.

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The latter combination, as one or the other, is fairly uniform, but the frequent association of depression and obsessional neurosis in percentage frequency is broken here, bedwetting being common and childhood sleep disturbances rare in depressive histories, and vice versa for obsessionals. The percentage association of hysteria and psychopathy is not so close as that found between depressives and obsessionals.

General Frequency of Terms in the Diagram.

40–50% : Loss of concentration ; complaint of insomnia ; headache.
30–40% : Nail-biting to 10 years ; shy, timid or non-aggressive ; general nervousness ; poor school record.
20–30% : Childhood phobias ; previous nervous breakdown ; unhappy childhood homes ; symptoms following injury or disease ; " domestic " stress ; fatigue ; restlessness ; emotionalism.
10–20% : Bedwetting to 6 years ; stammer in childhood ; excessive visceral responses to minor ordeals ; history of faints or blackouts ; history of head injury ; poor work record ; satisfactory interests (hobbies, etc.) ; genuine insomnia ; dyspepsia ; dizziness ; " pains " ; dyspnoea ; palpitations ; memory difficulties.
Up to 10% : Somnambulism ; traumatic stress ; poor childhood health ; functional " eye " complaints ; stammer ; faints or blackouts ; coarse tremor ; irritability ; sensitivity ; chronic cough.

(In women, poor work record, previous nervous breakdown and emotionalism arising out of maladaptation are more frequent than in men and concentrate towards hysteria.)

Most of the terms are self-explanatory. " Domestic " stress refers to genuine, severe marital, financial, business, or other worries.

" Pains " refer to neurotic " rheumatism."

" Eye " symptoms include haziness, tiredness, night blindness, etc. Affected relatives are parents and siblings. The average number affected is lowest in anxiety, 0·7, and highest in depressives, 1·7.

Discussion.

The confusion that is suggested by the above figures would be largely reduced if constitution was always distinguished from reaction type. This theme is an old one, of course. Adler made a General Diagnosis of Neurosis in general and added a Special Diagnosis, special to the individual case. Crookshank slightly modified this to the general neurotic character, with subdivided types of neurotic character and lastly the individual reactions. More recently Bowlby (1) has stressed the importance of the constitution, basing his genetic type and personality on variations of the schizothyme and cyclothyme personality, estimating the degree of instability and the present state. He drew attention to the frequency with which the quiet, moody child develops a depressive reaction, with which I agree. Much other work, including Slater's (2) on constitutional defect, is relevant here, but sufficient has been mentioned for my purpose.

A suggested grouping of basic personalities increasingly " abnormal " and possibly increasingly " organic " is as follows :

1. Normal.
2. Hysterical.
3. Obsessive-compulsive.
4. (Manic) depressive.
5. Schizophrenic.
6. Psychopathic.

Psychopathic is placed last because of increasing electroencephalographic evidence of its basis in brain pathology.

The reaction to psychological stress of any of these basic personalities may take the form of one of several patterns. The standard pattern is the anxiety reaction, an exaggeration of a normal mechanism. It is the most frequent response of " normal " personalities and is common in each of the other divisions. Hysterical, obsessional and depressive reactions occur in normal people or in any of the basic personalities.

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It is suggested that diagnosis would be clearer if a dual description were *uniformly* applied, as follows:

Normal personality.

Hysterical personality Obsessional personality (Manic) depressive personality Schizophrenic personality Psychopathic personality	with	anxiety reaction hysterical reaction obsessive reaction depressive reaction	or even with effort syndrome or hypochondriasis.

While mixed personalities are known, the constitution is mainly stable and should be recognized. The reaction can vary much more, and an anxiety reaction may change to a depressive reaction without any alteration in the basic personality. Such a common error as labelling an hysterical personality with a depressive reaction simply as a case of depression and confusing it with endogenous depression would be avoided.

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THE KIELDER EXPERIMENT.

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It is now three and a half years since the Navy opened Kielder Camp, and it has been suggested that some account might be given of its activities and of the results obtained there so far.

Kielder Camp is a special unit where " men who possess such a low morale, or such a degree of temperamental instability as to make them unemployable as combatants " are received and, wherever possible, treated. It came into existence to meet the needs of a particular group of men. There were the psychiatric cases —they went to hospital—and the delinquents—they went to detention ; but those who were both culpable and abnormal to some extent were not provided for until Kielder came into operation. These men were not wanted in ships or on foreign service, and neither were they fit subjects for invaliding on mental grounds. If such men were to " get away with it," the morale of others might well become impaired and the last state would be worse than the first.

In 1941 the Admiralty considered the establishment of such a unit, where hard manual work might be substituted for the hazards and hardships of active service afloat. Certain sites, including the Orkneys, were considered and rejected, and eventually a derelict camp was discovered in the heart of the Cheviot Hills ; it had once been a Ministry of Labour training centre for unemployed men, but had been abandoned and gradually fallen into decay. It was renovated and extended, and by January, 1942, was fit for use ; the first " patients " began to arrive in the following month.

Some Principles.

Some general rules regarding treatment and employment of the ratings sent to Kielder were laid down at the outset, but on the whole the officers responsible for running it were left a remarkably free hand to experiment—within the normal framework of Naval organization and discipline. The camp is not, nor ever has been, a sort of hospital ; neither is it a penal establishment. It does bear certain superficial resemblances to the Naval rehabilitation centre for psychiatric cases at Cholmondeley Castle, but Kielder is under executive, not medical, control ; and with Executive command goes the power of punishment. Punishment was considered to be essential as a last resort in dealing with certain cases at Kielder, and the undesirability of medical officers awarding punishments does not need to be stressed ; it is bad enough when one has to report on a malingerer, but one punishment from a medical officer and away would go the whole system of doctor-patient relationships.

However, Kielder Camp is a sort of combined operation between executive and medical authorities, though the responsibility for control and administration lies with the former. Perhaps the dual nature of this experiment can best be illustrated by the method of selection of personnel for the camp. The psychiatrist at one of the four big depots in this country submits certain men for the approval of his Commodore as likely material for Kielder, and those selected are put in a special drafting category known as C(Q) and sent direct to the camp. Possible cases in ships and hospitals are required to go to depot first, in order that the same routine may apply, thus ensuring some uniformity of standard for C(Q) ratings. It will be explained how the types coming to Kielder have altered with the passage of time, and how methods have been altered to cope with them. It has already

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been mentioned that Kielder is not a penal establishment. Certain restrictions are placed on newcomers, especially in the way of leave, supervision tends to be close, and the roll is called more frequently than elsewhere in the Navy; otherwise the camp does not vary in general atmosphere from the average shore establishment in this country. Granted, there is a row of cells in the camp; but so there is in the local police-station, and, like ours, they are usually empty. It is the supervision which prevents the commission of offences—a heartening factor when the previous records of most C(Q)s are remembered. In actual practice it has proved wise to close the eye of authority to certain psychopathic phenomena, which would have received condign punishment in an environment where the psychopathic personality is not appreciated.

The Material.

An astonishing variety of cases has arrived at Kielder during the last three years, presenting problems of every kind, and ranging from the "old lag" of classical type to the immature, frightened youth who has been unable to find his feet in the Navy. Many were men whom nobody wanted—idle, untruthful, insubordinate, vicious; others had once been genuine psychiatric casualties, but had gradually come to trade on their symptoms and, by failure to co-operate or misbehaviour in hospital, had become suitable cases for Kielder Camp. A few were suspected malingerers who had avoided punishment through lack of satisfactory evidence, or cunning, or both.

During this period a gradual change was observed in the material arriving at the camp. In the early days there was a marked preponderance of criminal and aggressive types, but these gradually gave way to the constitutional inferior and the hysteric. Such a change inevitably required an overhaul of the methods in use at the camp, and much of the original system had to be abandoned as time went on. It also had an effect on the results obtained by follow-up of ratings after leaving Kielder, for an aggressive man is of more value to a fighting Service than one who is timid or inadequate; the prognosis for further useful service is comparatively poor in the case of the latter.

The main types to be considered may be classified as follows:

(1) Cases of low morale, due to—
  (*a*) Stress of action, etc.
  (*b*) Constitutional timidity.
  (*c*) No ascertainable cause.

(2) Temperamental instability, due to—
  (*d*) Psychoneurosis.
  (*e*) Incipient psychoses.
  (*f*) Psychopathic personality.

(3) Malingerers.

(1) Straightforward cases of low morale were not seen so frequently as the terms of reference of the camp might suggest, though low morale was usually a contributory factor in the majority of cases seen.

(*a*) A very few men arrived who were genuine cases of "loss of nerve" following enemy action or hardship at sea; none of these cases were wholly genuine, in so far as one or more psychiatrists had suspected the presence of a determination to make capital out of the past in each of them. But it seemed inequitable that such men should be placed on exactly the same level as minor criminals and malingerers, and eventually instructions were issued to prevent further members of this group from arriving at Kielder.

(*b*) A very large number of constitutionally timid men were received. Most of these men refused to confess to fear on first interview, complaining instead of such vague entities as "trouble at home," which appears to be the projection of the rating's fears regarding his own future. Determined questioning on a subsequent occasion will generally elicit the fact that they are afraid of the sea, or of enemy action, or the whole strange new life in which they find themselves. The same previous history of inability to grapple with difficulties is generally forthcoming.

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Treatment in these cases consists very largely of repeated reassurance and of personal interest in the rating concerned. Fresh air, hard work, physical training, games, long hours of sleep and good food—all these tend to build up the general physique and increase confidence, so raising morale. The following case is a good example of this group:

CASE 1.—Seaman, aged 19. The youngest of four children, he had been over-protected by his parents. He disliked games at school and avoided playing them. Later, he had great difficulty in settling down in a job and tried six in rapid succession. He was conscripted at the age of 18 and trained as a telegraphist; but he made such a poor attempt to learn this highly specialized work that he was soon relegated to the seaman branch. Twice whilst under training he had reported sick at his home without adequate reason. He began to complain of headaches, which he said had been troubling him for years, and was referred to a psychiatrist. He was recommended for Category C(Q), and as soon as he arrived at the camp he complained of a headache and of a vague sense of malaise; he also asked if he could go home and see his parents, as he was very worried about them. His physical development was very poor, but there were no signs of disease. He stated that his father was "weak and thin, and had bad nerves"; his sister was "always ill"; his brother had been discharged from the Army with "bad nerves"; and his mother had "a weak heart and bad nerves." Further, all his mother's relations were "nervous," and one of her brothers was under certificate. He gave the impression of a lad who would have deserted long before but had insufficient courage to face the consequences; actually, he had never committed any offences in the Navy.

In due course he settled down in the camp, forgot about his headaches, and made the illuminating remark that he liked the place, "because he felt safe there from going to sea." He tried various methods to obtain his release from the Service, even volunteering for the coal-mines; but he was rejected as mentally unsuited to that type of work. He found a very good father-substitute in the camp, in the shape of a Marine nearly twice his own age, whom he followed about like a child. Eventually he was considered fit for duty elsewhere, as his general condition had greatly improved and he claimed that he felt quite well. He was drafted to a lonely air-station in the Orkneys, far from any suspicion of enemy action. Some months later a report was received stating that he was working satisfactorily, "humping cases of stores, opening and stacking contents, and cleaning store-rooms." The only trouble that he had caused was by his refusal to do fire-watching, on the grounds that he was afraid of the dark!

Another case, in which the environmental basis of his timidity outweighed the hereditary element, gave a much more satisfactory result:

CASE 2.—Marine, aged 19. This lad was said to have suffered from spinal curvature as a child, and had been treated as a semi-invalid by his parents. He had never been allowed to play games at school, and after leaving at the age of 16 he became a clerk in a rural bank. Two years later he joined the Royal Marines, "to show his father what he could do." He soon found that he was out of his depth, homesick, friendless and miserable; the physical exertion required by his training seemed to be beyond his strength. He could not keep even his kit in good order, for he had never brushed his own boots before enlistment. After several minor punishments he became mildly depressed and, secreting a practice round of ammunition, shot himself through the abdomen with his own rifle. He was taken to a civil hospital, and two operations were required to repair the damage done. On discharge from hospital he was referred to a psychiatrist, who recommended him for C(Q). On arrival at the camp he still appeared slightly depressed; his speech was slow, he looked miserable, and his general physique was wretched. He was put on an individual course of P.T., beginning with exercises to strengthen his abdominal muscles, and his endurance was slowly raised. An experienced N.C.O. of his Corps had several chats with him and showed him how to take care of his kit and person. At the end of his first month it was reported that he was "much happier and had no complaints," and he was already able to work hard without undue fatigue and could carry out quite difficult gymnastic exercises. After a second month it was further reported that he was a thoroughly satisfactory soldier and was asking for a draft to foreign service. Having regard to his previous history he was recommended for clerical duties, but passed fit for duty in any part of the world. He was returned to his depot three months after joining the camp, and it was reported by a trustworthy eye-witness that the R.S.M. of his depot refused to believe that he was the same man!

(*c*) A small group remains, of no specific type, the members of which have in common the same determination to refuse to face any form of arduous service. These men, though they have not undergone any stress, claim that they have "done their bit" (not infrequently in detention, if their records are inspected), or "had enough of it." They give no previous history of timidity—in fact, many of them were unduly aggressive in civil life. They seem to prefer fighting the police to engaging the common enemy, as various reports have testified after a Saturday night "ashore" in the nearest town. *À propos* the police, one such rating jeered

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at a policeman, telling him that he ought to be ashamed of himself for not fighting for his country like he was!—to such lengths will the mechanism of projection carry us.

No treatment has been evolved which affects the attitude of these men to any marked extent. Clap them in a cell or detention and they will laugh in your face, telling you that they would rather be sleeping soundly behind the bars than keeping the middle-watch on a corvette in a gale off Iceland. However arduous their life is made, however much the appeal of duty be made to them, they remain the winners as things are at present; it is fortunate that such cases are rare, Kielder forming a sort of sump into which fully developed specimens eventually drain. A few appear to improve a little after a stay at Kielder, but they rapidly deteriorate as the day for drafting draws near. In practice we are left with no alternative but to send these men to restricted service, so freeing more courageous individuals for duty elsewhere.

(2) (*d*) *Temperamental instability—psychoneurosis.*—Such cases make up a large proportion of the admissions to the camp. Some have made a good recovery from their breakdowns, but in most cases a few symptoms persist. It must be stressed that ordinary straightforward cases of neurosis are not sent to Kielder, but only such as have failed to benefit from long attendance as in- or out-patients at the various Naval hospitals and psychiatric clinics; cases moreover in which some factor such as delinquency or conscious exploitation renders some change of environment desirable. Refusal to part with symptoms, most of which are grossly exaggerated, is very common amongst these men. The great majority are "after their tickets," though most would be satisfied with "permanent shore service" as a sort of consolation prize.

All varieties of psychoneurosis have been received, though hysterical reactions are most common and depressions are rare; mixed states are particularly common. Bed-wetters, nocturnal shouters, headaches, strange dyspepsias, hysterical fits, dubious "losses of memory," and many bizarre pains—these have made up the bulk of Kielder's clinical daily bread. One more syndrome is sufficiently common to justify special mention; it leaves the patient perfectly well in cinemas, dance-halls, street-fights, and on the departure platform when going on leave; but it manifests itself in "terrible headaches," dizziness, faintness, "black-outs," and similar disagreeable symptoms whenever there is a hard job of work to be done, when the patient falls in for drill or P.T., or stands on the departure platform at his home town. We have had a lot of success in treating this disorder at Kielder, though our methods are largely empirical. Perhaps the most distressing discovery that a C(Q) can make is that every other man in his hut has identical headaches, dizziness, or what not, and that not only the medical officers, but even executive officers and petty officers, are neither impressed nor interested in these long recitals of ills.

It must not be supposed that the sort of men who reach Kielder are those who have broken down after fierce engagements with the enemy, not even through long months of strain and boredom on patrol or in the Tropics. For example, a recent admission was that of a rating who broke down after a month in his first ship—an old hulk which would never be required for service at sea, and which lay in dry-dock during the whole time that he was in her; the ship was several thousand miles from the nearest hostilities, yet his reaction to finding himself in such surroundings was an hysterical stupor. Others have not even got as far as that, but have produced symptoms within a few days or weeks of being conscripted. Even in these circumstances every opportunity is given for recovery, and it is only when all else has failed, or when symptoms are pleaded to account for some delinquency, that Kielder Camp is considered as a solution.

It would be impossible to give fair examples from this huge mass of material, but the two given below are average samples of our successes and failures:

CASE 3.—Seaman, aged 22. An illegitimate child, he was brought up by his grandparents. He was always somewhat anxious and inadequate, but did reasonably well at school, and then worked as a bricklayer. He volunteered for the Navy at the age of 19, and served for over 18 months on ships engaged in Atlantic convoys. He never saw any action and never underwent any personal stress, but he claimed to suffer from "nerves" and was sent ashore as "gun-shy." He was put on harbour service on psychiatric recommendation, and employed on small craft operating in the Firth of Forth. After a few weeks he reported "vomiting blood" on several

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occasions, but the actual amounts were negligible; he still complained of nervousness, so was referred to another psychiatrist and eventually put in Category C(Q). On arrival at Kielder he appeared to have a mild anxiety-state, associated with a very low morale, and still complained of "dizzy spells" and headaches. Hard work in the open-air and a regular routine devoid of excitement soon began to tell, and six weeks after admission he had lost all his symptoms except for an occasional headache after reading or writing. He stated that he would be glad to get back to sea again. Four months after admission he was drafted to a trawler base, and after a further period of four months a follow-up letter was returned from his medical officer, containing the following remarks: "His commanding officer was surprised, when I visited the ship, at any suggestion that he was of any medical interest. His work has been quite satisfactory, likewise his attitude towards authority. He is trustworthy, has not broken his leave, nor committed any offences. He has never been in the sick-bay. . . . Although his officers have always found him an efficient, clean and tidy rating, they have heard that some of his messmates consider him a little queer, though for what reason is not known. They consider him quite suitable for his present duties, and expressed the wish that all seamen were up to his standard."

On the whole, good progress has been made by most cases in which tension was prominent, the prognosis in hysterical reactions being correspondingly bad.

CASE 4.—Wireman, aged 30. He had always been healthy in civil life, and held a well-paid job as a slater for seven years prior to entry. His family history was unsatisfactory, however, his father and brother being epileptics and his mother's sister having committed suicide while under certificate. He was sent abroad, where he spent most of his time on shore; he never underwent any stress. After 18 months he began to feel anxious and started losing weight, collapsing in a dramatic fashion on five occasions. He was sent to South Africa and thence invalided home. Soon after arrival in this country he had trouble with his wife and failed to return at the end of his leave; he claimed to have lost all interest in the Navy and went to see a civil practitioner, who unwisely expressed the opinion that he ought to be discharged. Eventually he was picked up by the police and returned to his depot, where he was admitted to hospital for investigation. He made some progress, but his attitude was unsatisfactory, and he was sent on to Kielder. On arrival he appeared to have a mild anxiety-state, with both hysterical and depressive features. He was greatly helped by the quiet surroundings of the camp and by occupational therapy, but he remained spiritless and miserable. He did not seem anxious to improve—his attitude was essentially passive. Four months after admission he made no complaints, except for vague pains in the back after exertion; he also professed great fear of gunfire and air-raids. He remained unco-operative, however, and was considered unreliable for anything more than shore service in this country. He was transferred to another establishment for recategorization, but his unsuitability became apparent and he was invalided out of the Service as an hysteric in the following month.

(*e*) *Incipient psychosis.*—A number of psychotic reactions have been observed amongst the ratings sent to Kielder, and their interest lies in the fact that the psychiatric supervision available at the camp permitted diagnosis at a very early stage. They were made up as follows:

Schizophrenia	8
Manic-depressive psychosis:	
(*a*) Mania	1
(*b*) Depression	2
	11

The characteristics of the cases of schizophrenia are set out very briefly in the following table:

	Age.	Rating.	Diagnosis on admission.	Why diagnosis was revised.
1	23	Stoker	Malingering	Schizophrenic drawings in his possession.
2	33	A.B.	Psychopath	Auditory hallucinations.
3	22	A.B.	Hysterical psychopath	Delusions of persecution.
4	23	A.B.	Temperamental instability	Violent and inconsequent conduct.
5	18	Marine	Malingering	Hallucinations.
6	22	Seaman	Hysteria	Auditory hallucinations.
7	23	Stoker	Schizoid personality	Passivity feelings.
8	22	A.B.	Low morale	Ideas of reference.

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It might be of interest to record the reasons why these men were placed under observation in the sick-bay during their stay in the camp:

(1) Filthy habits and undue familiarity with superior officers.
(2) Phases of violent conduct and complaints that he was "being picked on."
(3) Wrote a familiar letter couched in insulting terms to an illustrious personage.
(4) Disobedience to orders and insulting a superior officer.
(5) Disobedience to orders and giving his pay away to other men in camp.
(6) Adopting catatonic "attitudes" when under treatment for catarrhal jaundice.
(7) Repeated complaints that he was being tempted by the Devil.
(8) Dreaminess and inconsequent conduct at routine interviews.

All of the above cases were removed to hospital for treatment as soon as the diagnosis was complete.

(*f*) *Psychopathic personality.*—Whole books might be written about our experiences with psychopaths at Kielder, of their extraordinary histories and strange behaviour, but it is not proposed to go into this type in detail here. Two main varieties of psychopath were seen, corresponding to the aggressive and inadequate types of the text-books. The inadequate psychopath, as seen at Kielder, was usually a lad from a superior home, with a good educational background and pleasant manners. These individuals had begun to go wrong as soon as the pressure of school discipline was removed, and had gradually degenerated by easy stages into loafers, rascals, perhaps even tramps. Several had tried many different occupations prior to joining the Navy, but had repeatedly failed to make good through loss of interest after the first few weeks at each. A few were anything but pleasant people, and made themselves conspicuous in the camp through untruthfulness and general irritability. One or two had been chosen as candidates for commissions, but their utter unreliability had quickly come to the fore in the arduous training required, and they had fallen back on delinquency to compensate for their sense of failure. Such individuals were often found poring over abstruse books, generally on philosophy or modern art; it was hard to tell whether the choice of literature was dictated by a desire for superiority or a retreat from hard reality into a more rarified atmosphere. A schizoid trend of personality was not uncommon, and a great deal of time was wasted on phantasies of grandeur which might have been put to much better use in the life of the camp. An example of this type is given below:

Case 5.—Sick-berth attendant, aged 22. This rating came from a good home, and reached the fifth form at a public school. His family history was normal enough, with the sole exception of his brother, whom he described as "rather like himself," and who had been expelled from a number of schools after a short stay at each. The patient had had six jobs in quick succession after leaving school, including that of junior press reporter, clerical work with four different firms, and on a fruit-stall in a market; in between these jobs he wandered about the country doing casual work on farms. As he put it, he always "felt the urge to go after three months."

Conscripted in 1942, he first trained as a telegraphist, but did not like the work and claimed that it gave him bad headaches. On failing to pass the test at the end of the course he was transferred to the seaman branch and drafted to a gunnery course; he refused to go, as he claimed to have conscientious scruples about killing others, and was returned to his depot. He now requested his release from the Navy on the same grounds, but he was considered to be set on avoiding service and was given a draft to a ship; before she sailed he was given a short leave, when he promptly deserted. He wandered about the country for some weeks looking for work, and eventually became an attendant at a fun-fair in a seaside resort. He was arrested by the police after he had been absent for over four months. Back in his depot he told a psychiatrist about his various feelings, and was told "that he had an abnormal mind—but they had been saying that for a long time at home." He was sentenced to 42 days' detention and greatly enjoyed the solitude of his cell. On his release he again raised the question of conscience and was transferred to the sick berth branch. He had had a slight stammer ever since the age of 8, and while undergoing his hospital training he began to agitate for treatment to relieve it. He was sent back to see the psychiatrist, who recommended him for Kielder Camp.

On admission he appeared to be a very intelligent and agreeable young man, who admitted to over-indulgence in phantasy, which was so real as to constitute (his own words) "a second existence"; these phantasies were generally concerned with fame and success. He worked very well in the camp and was employed in the sick-bay for some weeks; he also did well at P.T. and volunteered for some particularly arduous route-marches. He was also encouraged to study, and went up for, and passed, his examination in nursing subjects. In a series of interviews some attempt was made to reconstruct his personality as far as possible; he certainly

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seemed to benefit, becoming cleaner in person, more sociable, and more amenable to discipline; he seemed to be very keen on his work. As he evidently chafed at routine work, he was recommended for duty in an area of active operations, ashore or afloat. But after he left the camp he was kept in hospital for some weeks, awaiting a draft; he was unable to settle to the humdrum existence and eventually deserted once more. It is significant that he never deserted from Kielder, although he had many opportunities to do so.

Another example of the inadequate type of psychopath gives some vague indication of the extraordinary aptitude which some individuals have of causing the maximum amount of irritation and annoyance to their fellow men:

CASE 6.—Stoker, aged 20. His father, who eventually died young after prolonged overindulgence in alcohol, was said to have a vile temper; he kept a junk-shop in winter-time, but spent the summer months peddling and dealing in second-hand articles, taking his family with him in an old car. His mother died within a short time of her husband. The patient never learned much at school, being "on the road" with his father a great deal of the time; he did not like games, and avoided fights with other boys; he was afraid of the dark and of mice. After trying a number of different jobs he finally became a lorry-driver; but his working days were interrupted by two convictions, once for stealing lead from bomb-damaged premises and once for stealing bicycles. On the second occasion he was given three years' Borstal treatment, the charges including a savage assault on the policeman who arrested him; he had to be handcuffed. He was released on licence after serving less than a year and was immediately conscripted into the Navy; he served in various small craft, but never saw any action. At the time of the Normandy landings he was serving in a cable-ship; about two years after he joined the Navy the ship put into harbour and he was given short leave. He went to a neighbouring town to see an aunt, and on the way back to his ship told a soldier who was in the same compartment that he felt ill; he was put out at the next station and an ambulance obtained from the nearest Naval establishment. He was seen by a medical officer the same night, but nothing was discovered to account for his condition; he was discharged to his depot the next day. Meanwhile his ship had sailed and he was left in barracks without any kit. He wandered about the barracks, doing no work, and perpetually pestered his Divisional Officer with silly requests and complaints; he was sent to see the psychiatrist, who sent him into hospital for observation. He remained in hospital for a month, complaining of headaches and difficulty in remembering things; he was dirty and unco-operative, and failed to help in keeping the ward clean. Eventually it was decided that he was a "non-trier" and he was drafted to Kielder Camp.

On arrival he appeared to be playing the part of a man who wished to be mistaken for a lunatic, pretending that he could not remember when he joined the Navy, claiming to be a gipsy, and generally "acting wet." He had a khaki blouse instead of a jumper and he did not wear a cap. He put in a request to be allowed to live in a tent, as he was not used to a hut! He vomited ostentatiously every time he fell-in for Divisions, but was later caught at a tap a few moments beforehand, drinking enormous quantities of water to make himself sick. On another occasion he vomited water coloured with a little chocolate, claiming that he was vomiting blood. At first he was very unwilling to give any information about himself, but later admitted his criminal activities, and said that he was looking forward to a life of crime as soon as he got his discharge. The whole time that he was in the camp he repeatedly reported sick, but was never able to substantiate any of his complaints; he was kept at duty. He also haunted the Divisional Office, complaining about his treatment (medical and otherwise), requesting X-rays of his abdomen, demanding leave, asking to have the use of a volume of King's Regulations, and so on. On one occasion he arrived late for the rum issue, and when his request for a special "tot" was refused, burst into the C.O.'s office demanding justice. On another occasion he made an impassioned speech to a visiting Admiral, asking for his "rights" and threatening desertion, murder and suicide, one after the other. Sometimes he appeared dirty and insubordinate, at others he was very smart and punctilious; but at all times he was idle and argumentative.

Nothing could be discovered on mental examination to account for his eccentric behaviour, and his intelligence was average. He claimed to be unable to read and write, but wrote quite sensibly to his sisters. He was recommended for discharge from the Service as an undesirable character; it is possible that time will show that he was in fact a case of simple schizophrenic deterioration, but he was not lacking in emotional response during his time at Kielder, and he got a certain sly amusement from worrying his superiors.

The anti-social psychopath was more often aggressive than inadequate in type, and proved a very hard problem for the camp to solve. The majority of these men came from big towns, especially London, Glasgow, and Liverpool; they were often of mixed blood, in which the Clydeside Irish were particularly memorable. A few were very intelligent, but the majority were "dull normal," and appeared to take very little interest in anything except beer, betting, and women. They usually came from bad homes, where drunken parents fought their own children and each other, where one or more relations were either in prison or a mental hospital, and where they had long been accustomed to the sound of police-whistles.

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They nearly always gave the same history of truancy from school, of wandering from job to job a little later, and of repeated desertions since conscription. Punishment made no impression on them; they lived for to-day, and if that turned out to be bad, there was always to-morrow. Such members of this group as came to Kielder were very hard nuts indeed. A good example of this group is as follows:

CASE 7.—Marine, aged 23. Came from a healthy family in a large northern city. He admitted that he was always in trouble at school, usually for fighting with other boys. He became a bricklayer's labourer, but was unable to stick at one place for many days at a time and wandered about to different building sites all over the county. He married at the age of 19, but soon lost interest in his wife; he never went out with her, but came home fighting-drunk nearly every night. For some months he travelled round with a boxing-booth and was knocked out on several occasions. He was conscripted some two years before he came to Kielder, and never served outside the British Isles during the whole period. Before long he began to make a nuisance of himself—three times charged with leaving his work, twice remained absent over leave, and once struck a military policeman. Whenever he had any money he got drunk, and when on leave did not trouble about his wife, but went out with other women. He was described by one of his officers as "not amenable to discipline owing to his own peculiar constitution, which makes him unable to conform to regulations. He acts on impulse, lacks self-control, and is altogether undependable and unreliable." He also had some reputation for bullying the other men in his hut. It was remarkable that he had managed to keep out of the hands of the civil police.

On arrival at Kielder he was cheerful and argumentative, and inclined to be familiar in manner. He talked a great deal of nonsense about being "weak" and physically unfit for the Service. It was clear that he was a most dangerous man, and he was soon reported to exercise a bad effect on his messmates, many of whom were afraid of him. He was always loafing at work, and when cautioned would launch into a lengthy argument, which led nowhere; he was extremely cunning, and whilst "sailing near the wind" for some weeks, was careful to avoid committing himself. One night, however, he induced three other men to break camp with him, with the intention of deserting. The alarm was soon given and they were pursued; the delinquents suddenly came face to face with a group of instructors in a lonely railway cutting, bowed to superior force, and were brought back to camp without striking a single blow for liberty. In spite of the fact that he had already undergone two sentences in cells and four in detention, the "patient" was sentenced to 90 days in the latter, to serve as a warning to others. He was also recommended for instant drafting to a fighting front, as soon as the sentence had expired, in the hope that his aggressive tendencies might at last serve some useful end.

(3) *Malingerers.*—Most of the men admitted to Kielder showed some tendency to exaggerate and prolong their symptoms, but it was hard to determine the number in which there was a deliberate and clear-cut intention to malinger. Some had been suspected of malingering elsewhere, but had received the benefit of the doubt; others, notably certain hysterical individuals, proved to be malingerers only after prolonged and close observation. For example, one man wetted his bed night after night for many months and had avoided much disagreeable service on account of it; he had not suffered from this symptom before joining the Navy. He had foiled all the earlier attempts to "bowl him out," but early one morning the night-attendant in the sick-bay, pretending to be asleep, noticed the patient wake, take a quick look round the ward, and turn over on his face; he was then heard to pass water into the bed. A moment later the patient made a great show of rousing and immediately reported that he had wetted his bed again.

Another man had several attacks of cyanosis and pyrexia, accompanied by a considerable degree of tachycardia. He had several times gone sick at his home, and received a label of "cardiac failure." His stomach was washed out by tube on the third occasion that he became cyanosed in the camp, and he subsequently reserved his cyanosis until he got home on leave; he then reported sick again, but an escort which arrived for him without previous warning found him perfectly well. On being brought back to the camp, he admitted that he had been eating Anti-Gas Ointment No. 2 to induce the cyanosis. A very similar case was reported by Gough and Ashton (*Brit. Med. Journ.*, 1944, vol. ii, p. 834).

Even more common are the familiar pseudo-hysterical phenomena, such as bogus "suicidal attempts," remarkably convenient "black-outs," impulses, losses of memory, and so forth. These complaints are ignored as far as possible, and no avoidance of responsibility for offences committed under such circumstances can be accepted. It is highly probable that a great deal more malingering goes on in the camp than has hitherto been suspected, as new arrivals frequently complain that all the other men in their hut appear to be malingerers!

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Previous Records.

Before passing to the consideration of methods in use at Kielder, it might be of interest to give some information as to the previous records of some unselected groups of consecutive admissions to the camp.

One hundred men admitted during the latter part of 1944 and early months of 1945 gave a history of Naval service during this war ranging from 5½ years down to 4 months, with an average of 31 months; 7 had been serving in the Navy when war broke out. Their service at sea (or on active service ashore in the case of certain Marines) varied from none at all right up to 57 months; of the 71 who had been at sea or on active service, the average of such operational service was approximately 15·7 months. As regards offences since joining the Navy, another series of one hundred admissions in 1944 gave the following results:

Forty-three had committed serious offences, 19 had been in detention, 6 in cells, and 14 in both cells and detention. The record number of detention sentences for any one man was 10, and of cells and detention, 5 of each. Three men had received minor punishments and one had had his sentence of detention suspended. The total number of sentences of detention between these 43 men was 76, and of cell-punishments 32. The longest sentence of detention was for 7 months.

The offences are set out below:

Absence without leave*	120†
,, ,, and striking a superior officer	4
,, ,, and skulking from place of duty	1
,, ,, and smuggling	1
,, ,, and absence from place of duty	5
Missing ship on sailing	2
Deserting post as a sentry	1
Breaking out of ship	2
Leaving a draft	3
Refusing an order	1
Insubordination	1
Drunkenness	1
Negligent performance of duty	1
Taking a service car without permission	1
Total	144

* Includes desertion. † The longest was for 15 months.

Of yet another hundred admissions during 1944, the following information was obtained regarding civil convictions:

Offence.	Number of men convicted.	Number of convictions.
Robbery with violence	1	1
Assaulting the police	1	1
Simple assault	3	5
Causing malicious damage	1	1
Housebreaking	2	2
Shopbreaking	1	1
Car-stealing	3	6
Simple larceny	5	10
Receiving stolen goods	3	3
	20	30

N.B.—Only serious offences are recorded. 16 men out of the 100 had been convicted, but 4 had committed two different kinds of offence.

These figures may convey some idea of the material which has passed through Kielder Camp since it opened in 1942. But it is as well to emphasize that the figures are probably much lower on paper than they are in actual fact, as they have been compiled from the statements of the men concerned and not from official documents; experience has shown that most men will whittle down or deny their previous civil criminal records after they have joined the Service.

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Treatment.

An attempt has been made to salvage as many as possible of the ratings sent to Kielder, not only for the Service but for Society; the methods used can best be considered as (1) general and (2) special.

(1) *General treatment.*—Kielder Camp has been variously described by its inmates as "a concentration camp," a "rest camp," a "medical detention camp," and a hospital; it will be observed that these descriptions cancel out. Some men look upon it as a haven of refuge, and others pretend that it is worse than a detention establishment. In actual fact there is no mystery about it, as the following description may serve to show.

The camp itself is situated in a valley, hemmed in on three sides by desolate hills, and with the North Tyne itself forming part of its boundaries. The isolation is extreme, and serves the double purpose of discouraging deserters, and avoiding the visits of camp-followers and general "hangers-on." The district is remarkably healthy, and physical illness is very rare in the camp, even in the coldest winter. No barbed wire surrounds the huts and any C(Q) who cares to walk out finds nothing tangible barring his way; needless to say, very few have made the attempt, as it involves a thirty-mile walk.

Leave is restricted, and until a rating has behaved himself for one month he gets no "shore leave" whatsoever; of course, he may leave the camp many times during that period, but only to work or go for a route-march. After he has had four Saturday afternoons ashore without untoward incident, the C(Q) becomes entitled to a week-end leave at his home; subsequently he gets another week-end each month that he remains—and behaves himself—in the camp. A few men who have done especially well are granted seven days' leave before drafting to a ship, or to shore service abroad. The daily time-table is as follows:

6.45 a.m.	Hands turn out.
7.15	Fall-in for 20 minutes' P.T.
8.0	Breakfast.
8.10 (onwards)	Sick-list.
8.45	Divisions and Prayers.
9.0	Work commences.
10.45	Stand-easy for 10 minutes.
12.0	"Secure" (i.e. pack-up work).
12.10 p.m.	Dinner.
1.20	Fall-in; work recommences.
2.45	Stand easy for 10 minutes.
4.0	"Secure."
4.10	Tea.
5.0	Fall in for Evening Quarters.
(onwards)	P.T. or instruction.
6.0	"Secure."
7.0	Supper.
10.0	Pipe-down.

Apart from those employed away from the camp, the C(Q) usually does the routine work of the camp in the morning, the afternoon being set aside for school, games, O.T., drill, or a route-march. After tea the rating may attend a P.T. class or a discussion group in the schoolroom. Those on outside parties are away from the camp until teatime.

When the camp was opened it was hoped that the surrounding State Forest would provide an inexhaustible supply of hard outdoor work for the C(Q)'s, but it has gradually become less and less important as the available work in the vicinity of the camp has been completed. It is unfortunate, as timber-felling was a most healthful and popular form of employment for the ratings, besides being of direct value to the community. Other useful work has included land-drainage, assisting in the building of a dam for a reservoir, and (in summer) a great deal of farm-work; some farm-parties have been employed as far as ten miles from the camp. Some

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of our worst men have worked well at these various occupations, and the poorer specimens have been built up from the physical aspect. Of indoor labour, sawing up logs has proved a good stand-by for wet weather; but there are many other minor tasks which have to be done by the C(Q)s, from servicing lorries to peeling potatoes.

Physical training is intended to tone up the flabby and weak, and to make all the C(Q)s more alert. It is thorough and exacting, and a great deal can be learned about a man by watching how he tackles the more difficult individual feats. Compulsory football is another important item in the regime—it was necessary to make it compulsory, as otherwise certain enthusiasts monopolized the football field, and those who needed it most were left out.

(2) *Special treatment.*—The most important element in the system of rehabilitation at Kielder has undoubtedly been personal influence; there is probably more personal attention there than anywhere else in the Navy, partly due to the small number of C(Q)s—about one hundred has been the usual strength of the C(Q) division—and the comparatively large number of officers who are concerned with them. Each rating has not one but several interviews with the commanding officer, schoolmaster, chaplain and medical officer—as well as with the psychiatrist, who does not ordinarily see any of the sick-list, but is concerned with the progress of the C(Q) in a more specialized way. The various officers have tried to influence the ratings from their own particular aspects, and are ready to pool their knowledge for the benefit of the others; in this way a common policy can be reached. The commanding officer discusses the Navy and its problems with each new arrival, and assesses him from the executive aspect; later, when he has got a clear impression of the individual, he arranges his draft after discussion with the psychiatrist. The schoolmaster has a difficult task, as he is required to teach classes drawn from many different walks of life, of different ages (anything from 17 to 45, with an average of about 24) and of very different outlooks. Intelligence, too, is very variable; for although it was decided that defectives should not be sent to Kielder a number of dull men have been received, and it is difficult to place them in the same class as those who have had a secondary education, for example. However, every man has his I.Q. tested when he joins the camp, and it has become usual to excuse the more backward individuals from school altogether; incidentally, it is practically impossible to rehabilitate a backward man up to the standard required for further useful service—there is so little to which one can appeal, and so few grounds on which personal contact can be made. Those men who are not excused school in this way are required to attend for 10 half days during their first month in the camp, the ground covered dealing chiefly with current affairs, elements of citizenship, and (a useful aid to those "unable to concentrate") a modicum of mathematics. After he has finished school, every C(Q) attends a discussion-group on certain evenings of the week in the schoolroom until he is nearly due to leave the camp; Housing, Education, Unemployment, and similar topics are discussed, and in hot debate the anti-social individual begins to feel the weight of public opinion, and possibly learns for the first time that no man has a right unless another has a duty. School has done an immense amount of good at Kielder, and very few have failed to enjoy it.

Annexed to the schoolroom is the Occupational Therapy room, under the charge of a skilled instructor. It might seem illogical that delinquents and malingerers should enjoy such amenities, but time has proved that it fulfils a useful purpose in providing both outlet and interest for certain men who would otherwise have "stuck" or deteriorated. It began as an evening employment for idle fingers, but has gradually grown into a regular form of treatment for the anxious and unhappy, especially for those confined to the sick-bay. Woodwork, plastic-work, painting and drawing have all had their vogue, but the first-named has proved the most satisfactory here.

The Medical Department is peculiarly placed, in so far that it provides both the ordinary service required for the minor ailments of the camp and the amenities of a small mental hospital. Men have frequently stayed in the ward for observation, and others have lodged there for weeks at a time, issuing forth to labour and instruction with the rest of the camp.

Every man is thoroughly examined from the physical aspect as soon as he joins the camp and he is weighed regularly once a week. Psychiatry is mainly con-

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cerned with diagnosis and supervision, together with an eventual assessment for further service; but each man has a number of interviews, as may be considered necessary, in which an attempt is made to unravel his difficulties and to make suggestions for his future guidance. Close co-operation is necessary between the psychiatrist and the other officers in the camp, and he is responsible for advising the Commanding Officer on the treatment and disposal of the C(Q)s.

Methods have gradually altered in process of time, the emphasis changing from hard work and restrictions to rehabilitation by pressure. The aggressive rating has required an outlet to his impulses, and this has been provided by P.T., games, and open-air work; and the timid and half-hearted have been encouraged to exert themselves, both physically and mentally, in an effort to improve their morale. But behind the daily work and exercise there has been the constant round of Naval routine, with hoisting Colours, Divisions, Church, Rounds, and even the rum-issue —all playing their part in keeping the rating in touch with the Service to which it is hoped that he will eventually return, and negativing the "hospital" atmosphere; and the presence of "sanctions" already referred to has given the camp a big advantage over a purely medical establishment.

Results.

After a rating has been three months in the camp, his suitability for draft comes up for discussion; if he is an exceptional man, he may get away in a shorter period, and if he is not really dependable he may be retained for as much as six months, or even longer. Between 3½ and 4 months appears to be the average stay. Four months after each rating leaves the camp a follow-up letter is sent to the medical officer of his ship or establishment, requesting a reply to certain questions. Only about half these forms have been returned completed, but this is not surprising in a huge Service engaged in a global war, when ships and men move about with bewildering rapidity. With this in mind, however, it will be seen that the results obtained are on the whole satisfactory, especially when it is remembered that it is only the cast-offs of other establishments which arrive at Kielder.

Drafting is a very important function of the camp. "Occupational diagnosis," the process by which the psychiatrist can control his patient during the whole of his daily work, has enabled a definite decision to be reached in many problem-cases; certain men have been recommended for discharge as incorrigible or useless, and yet others have merited medical disposal. After observing a C(Q) rating for a number of weeks, it is usually possible to give some suggestions for his future employment in the Service; some men require restricted duties, such as service in depot-ships, boom-defence vessels, small craft operating in coastal waters, or shore bases at home or abroad; but over one-third are considered fit for general service, which means any form of duty anywhere. A rating sent back to any form of useful service releases another for duty afloat—an important consideration in recent years.

Many points are taken into account when a man's draft is under discussion. For example, a psychopath who has reacted badly to the precision and discipline of a battleship, may do very well in the Bohemian atmosphere of a trawler. Those who are afraid of the immense spaces and big seas of mid-ocean may perform a useful function in a boom-vessel at a harbour mouth—work that has to be done by somebody. A branch change may also seem advisable: a poor seaman may make a good writer, or a bad steward may blossom forth as a capable cook. Within the confines of the camp we have been able to experiment by trying men at different jobs, if the situation appeared to warrant it.

Some individuals who came to the camp with an impaired morale have been lent for a period to certain trawlers and other small craft at the nearest base; only those who have completed two months at the camp are recommended for such a trial of reliability. The safeguard lies in the fact that the rating knows that he has only to admit that he cannot "take it," and he will be returned to Kielder forthwith. Only two or three men tested in this way have failed to make good, and many have asked to go back to the same ship in which they were tried out. When the time comes for drafting, the rating is generally glad enough to go, and only very rarely has a "shanghai" on board a ship about to sail been required.

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The results of the follow-up already referred to are as follows:

Total number joining the camp in three years 842
Total number of C(Q) ratings admitted in this period who have since been drafted 680

Duty to which drafted.	Number.	Good report.	Bad report.
General service	271	62	34
Depot ships	44	15	10
Patrol service	44	30	14
Boom defence	65	12	2
Shore service abroad	74	12	7
Home shore service	182	101	38
	680	232	105
Discharged, " services no longer required " (i.e. incorrigible)			22
Discharged, " unsuitable " (i.e. unlikely to make an efficient sailor)			22
Invalided out of the Service—on physical grounds			7
" " " —on neuro-psychiatric grounds			60
Miscellaneous disposals (deserters, civil prisons, etc.)			37
Retained in the camp			14

The diagnoses of the neuropsychiatric cases which required invaliding are as follows:

Hysteria	12
Anxiety state	5
Depression	2
Schizophrenia	6
Psychopathic personality	10
Constitutional inferiority	9
Temperamental instability	3
Nocturnal enuresis	2
Nervous dyspepsia	2
Convulsive tic	1
Mental backwardness	8
	60

A number of psychotic patients have been retained in hospital for treatment.

Conclusions.

It will be seen that reports were obtained on some 50 per cent. of the ratings drafted from Kielder; there is no reason to believe that medical officers have been more ready to notify successes than failures, however. Thus 27·5 per cent. have been giving good and useful service four months or more after leaving the camp, and 12·4 per cent. have committed serious disciplinary offences, or required further psychiatric disposal or treatment, or have proved general failures. No hard-and-fast conclusions can be drawn from the above figures, except that two-thirds of the cases reported on seem to have made good—at any rate up to the time that the reports were written.

Some of the reports are extremely disappointing, as in one case where a rating, who had done very well in the camp, joined a ship and smashed a great number of light-bulbs with a hammer directly she left port; others deserted a few hours after leaving the camp. On the other hand, excellent reports were obtained from a still larger number—one man had been commended by his Admiral for bravery, another had been made a petty-officer, and so on; and some had been lost at sea in the defence of their country.

Besides the actual results obtained in this manner, the camp has performed other useful functions. Over one hundred men who were unsuitable for Naval service, either by reason of mental or physical unfitness or on account of delinquent tendencies, have been extruded from the Service machine. It is possible that some of these men might have caused a great deal of trouble in an environment where their shortcomings were not immediately understood. It cannot be contended

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that the training in the camp has any real value from the purely Naval standpoint, but there is a wider aspect to the instruction given which has not been lost sight of by the authorities concerned. Apart from the training purely designed to make unfit men fit, or relatively unfit men fitter, a great deal of thought has gone into the problem of making them better citizens. Apparently the individual contacts built up between officer and rating under the peculiar circumstances of this camp have assisted certain individuals to change their attitude towards the community as a whole, and to discover for the first time that their own paranoid suspicions regarding the country in general and the Navy in particular were not grounded in fact. Gradually a better attitude towards authority becomes apparent in the majority of cases, hostility dies away, and perhaps some shame-faced mutterings begin to be heard about " getting back to sea " ; then is the time to draft, and men caught in this frame of mind and got away to a ship before they can deteriorate generally do very well.

Another value of the camp has been its presence as a sort of trump-card in the hand of the depot psychiatrist, to be played in the face of rank non-co-operation, half-heartedness, and possibly malingering. It is probable, too, that the camp exerted a wholesome prophylactic effect in the depots while it was still unknown outside the realms of rumour.

The various psychiatric specialists have testified as to the value of Kielder as a deterrent in this way.

Finally, there is the experimental aspect of the camp. It has now been demonstrated that, provided the State is prepared to spend sufficient time and effort over the individual, a possible two-thirds of the worst hooligans and bad psychiatric bets in the Navy in time of war can be reclaimed in some measure, and that further useful service can be extracted from many of them. Naturally the Navy was more interested in raising and maintaining their morale, but the question of making bad citizens into better citizens was not forgotten.

It is only fair to add that great difficulties were encountered at all stages. Perhaps the greatest problem was that of staff, for the Fleet requires first choice of personnel, and with a few exceptions those who assisted in the work at Kielder were old, or unfit, or inexperienced. But there was also the sense of isolation from the outside world with which to contend, not to mention a series of wet summers and cold winters—no pleasant experience in a hutted camp. Finally there was the presence of the men sent for treatment ; the majority of these were neither genuine medical cases nor pure delinquents, and daily contact with large numbers of men of this type over a long period is extremely irritating to those who are neither interested in nor gifted for this type of work. It is remarkable that good results continued to come until the very end, in spite of many disappointments and setbacks.

Kielder Camp was closed on July 13, 1945.

My acknowledgments are due to Surgeon-Lieut.-Commander H. G. Silvester, O.B.E., R.N., who had medical charge of the camp during the first half of its existence ; and my grateful thanks to Surgeon-Captain D. Curran, F.R.C.P. R.N.V.R., for his encouragement and help in the preparation of this article.

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A CASE OF OBSESSIONAL STATE OF UNUSUAL CONTENT.

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WE wish to record a case of obsessional neurosis remarkable for its strange content and unusual form, and in doing so to draw attention to the comparative rarity of this condition as a primary diagnosis in Naval Psychiatry. Our observations on the last point may not be without interest in considering the aetiology of this condition.

Case Report.

The patient, a signalman of the Regular Navy, aged 24, was admitted to hospital in September, 1944. He said that he was quite well physically, but that (in his own words) "I have some nervous trouble which keeps making me go back and which keeps me in a state of doubt and indecision." Except that he looked older than 24 there was nothing to note in his appearance and physical examination was negative.

He proved to be a pleasant, well-spoken man, intelligent, and co-operative. His past history showed no serious illness except chorea when aged 5–6, and he had had no nervous upsets and there is no note that obsessional features accompanied his chorea. His father and mother are alive and well, his father being headmaster of a boys' school. His only brother, an R.A.F. pilot, had recently been grounded after three years owing to lack of confidence with landings. There was family history of two uncles having some nervous upset after the last war, but none of any upset obsessional in type. He was married in July, 1944, is a moderate smoker and of very temperate habits.

His birth, childhood and adolescence until 15 were apparently normal and he could recall no unusual characteristics. He did well at school and joined the Royal Navy at 15½ as a boy sig., doing normal training, during which he learned neatness and exactness in stowing kit, etc. He served in establishments and ships of all types until his admission to hospital, and had seen enemy action in the blitzes on Portsmouth and Liverpool and in the Dieppe raid, in which his ship had been temporarily grounded. The degree of stress in these incidents is difficult to assess, but must unquestionably have been fairly great, though with his Service training and high morale he tended to make light of them.

He recalled that he had first noticed anything incapacitating about 2½ years prior to admission to hospital when, he says, he became more exacting in how he put things and began to distrust it if he had not done a thing himself. He had first "checked up" on others' doings and later on his own. This tendency he felt had grown and enlarged, though his description was extremely clear and his feelings were strictly confined to tactile and spatial relationships. Thus he described considerable difficulty in convincing himself that a piece of paper which he had just screwed up and thrown into a wastepaper basket had, in actual fact, gone where he had seen it go and was not still in his hand. He knew it was not there and that he had seen it go into the wastepaper basket, but he retained the "feel" of it in his hand. He was able to remove the illusion by wiping his hand with some other object, e.g. against his trousers. He had similar difficulties in posting letters. Perhaps his most distressing disability lay in his spatial relationships. He described considerable difficulty in going from one place to another as, having walked from A to B, he would have to return to look at A to make sure that he had really left it and to retrace his steps. This feeling was often satisfied by being able to look back to A and see the place whence and the route along which he had come, but crowds and the presence of many others worried and upset him. He described how he relived incidents and journeys, and would tire himself out tracing and retracing his steps. One particular incident which stood out clearly in his memory was of how a vest which he had washed and hung up to dry blew away over the ship's side and, although he knew it was only a vest, he could still "feel" himself inside it—more particularly because he could so easily imagine the sensation of the vest in contact with his person.

There was apparently no affective disorder, his personality was excellent and well preserved, and memory, concentration, grasp and intellect all good. Intelligence measured by the Wechsler method was 121, Shipley's Vocabulary 36, Kohs Blocks (1st 10 subtests) 97, mental age 20 years. There was complete congruity and a normal warmth of emotion. He showed no thought disorder, ideas of reference, feelings of passivity, depersonalization or derealization, and no delusions or hallucinations (for his feelings with regard to things with which he had been in contact were

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not considered hallucinatory). He described his difficulties as "just stupid" and quite unreasonable, and we should like to point out that it was the IDEAS that were obsessive and that many of the actions were not compulsive, being done purely to ease his mind and to relieve tension, though what they may become in the future must remain for speculation.

He was seen in consultation by Surgeon-Captain Desmond Curran, R.N.V.R., who considered him to be suffering from a true obsessional neurosis of very bizarre and unusual nature.

In hospital he improved greatly following a period of prolonged heavy sedation. He was subsequently able to take part in games, including football, though after these he liked to be the last to leave the field so that he could look back at it quite clearly. Thereafter he would relive the game, again "feeling" the ball on his toe and himself in various places on the field, though he knew well and fully understood that this was purely "an idea" and could not actually be. He found movements to order, e.g. class physical training, considerably easier than movements carried out of his own volition. Cycling he found interesting and relatively easy, as his feet, hands and seat retained their contacts and relationships to the various parts of his bicycle and the movement of this in space did not worry him much, though he had a tendency (not overpowering) to look back.

One extremely interesting point in this man's history showed itself in relation to his work. As a result of his continual retracing of his steps he would tire himself out, and in August, 1944, whilst serving in one of H.M. battleships as a l./sig., he felt so weary one night that he slept for a few moments whilst on watch—a matter which was duly reported and an offence for which he was deprived of l./sig. rate and his good conduct badge, medical examination having failed to reveal any abnormal physical signs suggestive of disease. The patient bore no malice or ill-will over this and apparently regarded it as a fitting punishment for such an offence, completely overlooking the fact, which he only admitted on questioning and certainly did not produce as extenuating circumstances at the time of disciplinary action, that sleep was due to being completely exhausted through the constant climbing and reclimbing of ladders to check up that the way he had come was exactly as he knew it to be.

This rating was eventually discharged, invalided, as being unlikely to be able to give further good service in the Royal Navy, and in order to stand a more reasonable chance of adaptation and of building himself an ordered routine in civil life.

Definition.

Bernard Hart (quoted by Dawson (1)) gives as a definition of obsessional state "an idea, action or fear intruding itself into consciousness in a manner which is felt by the patient to be irresistible." Dawson goes on to say that the patient recognizes the compulsive insistent quality as subjective, dislikes, resents, and tries to fight it. He states that it is characteristic of patients with this disorder that they have full realization that their reactions are abnormal, and yet they persist in them in spite of all endeavours to be rid of them—it is just in this way that they differ from simple preoccupations. The acts may sometimes be taken on in an attempt to ward off anxiety as it were by magic; as Dawson puts it, "the making of pacts with himself is one of the characteristics of this type of illness." The acts serve no useful purpose and render life difficult, though the patient will try and rationalize his actions and adapt himself and his living to include them; although still recognizing that they are alien to his way of life.

Lewis (2) insists that daily life is interfered with, the obsessions intruding so forcibly that the patient is unable to attend to other things and to retain peace of mind. He holds that mere preoccupation is not enough, the condition is a morbid one, the patient actually suffering, though having a real insight into the subjective nature of it. Mere compulsive behaviour is in itself not necessarily obsessional for, not recognized as subjective, and occurring without insight, it may be a feature of a psychotic disorder.

Aetiology.

There has been longstanding discussion over the aetiology of this condition, and the importance played by psychogenic, constitutional and organic factors.

Gordon (3) quotes four out of six cases who went on to illnesses of the paranoid type, and Schilder (4) considers that there is an organic background with demonstrable physical signs in a third of the cases. Lewis (2) states that it is a disorder occurring usually in the first half of life, and that an organic basis should be suspected if it arises in the involutional period. He also hints at the possible constitutional origin in his reference to the heredity factor, the intractable nature of the complaint and its nearness to "formes frustes" of schizophrenia or manic-depressive psychosis.

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We can recall one other case seen at this hospital and not included in our figures which, after having had a well-marked obsessional neurosis for some time, developed a severe schizophrenic episode with hallucinations, only to return to the obsessional state when the schizophrenic reaction had disappeared. One case included in our figures was a man who had a well-marked obsessional state in addition to a manic-depressive psychosis.

Frequency and Occurrence.

The frequency of a diagnosis of obsessional neurosis in Naval psychiatry is very low. Figures for this hospital show :

In-patients.

Period.	1941, Sept.–Dec.	1942.	1943.	1944.	1945, Jan.–Mar.	Total.
Invalided with this diagnosis	—	1	2	2	2	7
Total admissions	397	1,043	866	969	234	3,509

Out-patients.

Out-patients seen at this hospital over a period only five months shorter show similarly low figures,

Cases : 4 Naval ratings and one W.R.N.S. rating = 5
Out-patients seen . . . . = 2,160

with the additional case already mentioned of the man seen primarily for his manic-depressive psychosis.

In one of the main Naval Depots the Neuropsychiatric Department has seen only four cases out of a total of 3,463 in 20 months, all of which are included in our In-patient table.

Neither at this hospital nor at R.N. Barracks were there any officer patients with this illness.

For Naval officers figures quoted from the hospital dealing with psychoneurotic officer patients, the figures show :

June, 1940, to February, 1942 (20 months) : Patients, 224 ; obs. neurosis, 4.
March, 1942, to October, 1944 (31 months) ; Patients, 244 ; obs. neurosis, 4.

We can, of course, give no figures for peace time and have, therefore, no comparison which we can make in incidence, but those we quote can hardly show a marked increase for the war period.

Gordon and others (5) give their incidence as 12 per cent. of psycho-neurotics, but Lewis (6) in his account of the incidence of neurosis in wartime England hardly does more than mention the occurrence of obsessional states, and notes that there has been no striking increase but rather a drop in the occurrence of neurosis in England in wartime. He is, of course, dealing with civilians up to 1942. The number diagnosed as obsessional state and seen at Maudsley Hospital Out-patients between January 1, 1932, and January 1, 1936, was 199 out of 9,396—slightly over 2 per cent. of cases seen.

The suggestion is that by now—1945—there is an increase in the incidence of illnesses of psychogenic origin, anxieties, hysterias and depressions being most markedly increased. Obsessional features do undoubtedly occur in the symptomatology of some of these conditions, but the incidence of obsessional neurosis as a primary diagnosis does not show an upward trend. Depressive and anxiety reactions showing obsessional ruminative features are perhaps expecially common, but these are not included in the discussion of this case, nor are we concerned here with the phobias (of which none has been seen at this hospital), nor of the fear states masquerading as obsessions and of hysterical origin. Patients with obsessional neurosis have *not* broken down under stress, but tend rather to have stood strain well. Of men who have broken down to reactions of anxiety type it has frequently been noted that in their personal histories they have had what might well be termed obsessional features, but in no case was the breakdown a recurrence of, nor an increase in, such obsessional features.

Discussion.

The patient in the case described was a particularly good witness, and in spite of the somewhat bizarre flavour of his doubts, there was nothing revealed in his personality nor on history taking nor on examination to contradict the feeling that

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this was, in fact, a genuine obsessional compulsive state; certainly the patient himself regarded his difficulties as unreasonable and stupid, and he never gave any suggestion that there was any doubt in his own mind as to his individual integrity, i.e. he never felt unreal or split up in himself, and he denied any feelings of Doppelganger type. Although he would return to a spot it was to identify it as such, and see that he had left it, rather than to collect any part of himself which he felt he had left there. We could find no evidence of a disorder of the schizophrenic type, and although he could "feel" that he had retained contact with objects, e.g. football, and would look to convince himself that the idea was only an illusion, he was quite clear that it was "an idea that it might be there" rather than an apparent peripheral sensation.

The contents of obsessional neuroses are many and varied, but in the literature to which we have had access we can find no reference to a case showing such clear cut or bizarre features, nor relating only to tactile and spatial relationships, such as the one which we have described, though Straus is quoted by Schilder (4) to have drawn attention to space disturbances in the symptomatology of obsessions.

Naval life and routine, with its insistence, from the earliest days of training, on exactness and neatness may be considered to foster any obsessional traits, and may actually tend to produce a condition, superficially mildly obsessional in its striving for perfection and exactitude and in a never ending check up—a fact particularly well seen in many long-service ratings and older Warrant Officers. This condition cannot be classed as an obsessional neurosis, for its non-achievement does not make the person unhappy, nor does he recognize the condition as one of which he would gladly be rid. This is well described by a Wren patient—herself grossly obsessional—in referring to a Pensioner Chief Petty Officer " . . . is so maddening in his deliberation and exactitude that I could scream."

It might, therefore, be thought that ordered Naval life and training would suit such patients, but it must be remembered that they tend to be rigid, non-adaptable people who cannot mould to a routine unless it be one of their own construction and not one to which they are required to conform.

Lewis (2) and Dawson both remark on the rarity of criminal tendencies in these cases, the patients always resisting compulsive acts towards crime. In the case we describe, one particularly unfortunate feature was the disciplinary trouble into which this man's compulsions led him, for though his actions in themselves were not wrong and involved him in no offence, he was severely penalized for sleeping as a result of exhaustion produced through his disability. This can only stress the added difficulty with which such patients may have to contend in the Service, and the care which Service medical officers must exercise in order to ensure that men are not punished merely because their disorders are not accompanied by grossly abnormal physical or mental signs, and because the man himself makes no complaints.

Summary.

(1) An interesting case of obsessional state with unusual content is described.

(2) Definition and diagnosis are discussed.

(3) The incidence of obsessional state as a primary disability in the Royal Navy is shown.

(4) The aetiology is briefly discussed. The incidence of the condition in a disciplined Service under considerable stress lends support to a belief that the disorder is endogenous in origin.

We wish to thank Surgeon-Captain Desmond Curran, R.N.V.R., for much encouragement, helpful criticism and advice.

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PHANTASIES IN EVACUATED CHILDREN.

By Frank Bodman, M.D.,
Consultant Psychiatrist;

Elspeth Stephen, M.A.,
Educational Psychologist;

and

L. K. Sambrook,
Assistant Psychologist, Somerset County Council.

In view of the many problems that are bound to arise in dealing with "displaced children" in Europe, we thought it might be useful to report the following cases, which illustrate the dangers in accepting accounts, however circumstantial, from children about traumatic situations which had occurred to them. The young child's difficulty in separating fact from phantasy is normally fairly pronounced. Under the impact of traumatic situations, such as personal injury, death or separation from the parents, this tendency to confuse fact and phantasy becomes still more marked.

Ronald P— (born 8.ix.35) was referred to Somerset Child Guidance Centre on 18.v.44 as dishonest, untruthful and uncontrollable by a billeting officer.

The school reported that he was backward in his work, a queer boy, got very excited and noisy, wanted attention. "He seems to have very little feeling for anybody; has no friends; other children find him irritating. He tells fantastic lies. Told neighbour that *his father was a fireman and had been in hospital since the Lewisham blitz.* His arithmetic, writing and spelling are poor." (He was examined 11.vi.44 by Miss Stephen, the County Psychologist, and found to have an I.Q. of 116.)

Miss Stephen reported that he thrives on success. At the beginning of the test I got the impression of a dull child, but he 'lit up.' He has initiative, spontaneity, and makes a good superficial relationship. He did not appear to be very attached to anyone. He is out to make a good impression. He told the psychologist he thought *he had been bombed out of London. He can remember having to stay in the house because there was shrapnel about.* He was not frightened of the blitz. He did not like snakes. There were so many snakes in the country he wants to go back to London after the war.

The Psychiatric Social Worker, Mrs. White, reported that this boy had been billeted for four years (i.e. since 1940, when he was 5) with an elderly woman and her husband in a remote part of the countryside. The billetors were very strict Nonconformists and had brought Ronald up in a religious way, sending him to Sunday School and meeting. The foster-mother was very fond of him, but her health was deteriorating and the foster-father appeared to be very anxious to get rid of Ronald. The foster-parents had a son of 14. Ronald's untruthfulness was a major sin in their estimation.

They had never succeeded in getting in touch with this boy's family, but they had noticed that on the boy's identity card the mother's family name was different to the boy's. The school had a new head mistress, who had found letters from the London authorities, stating that Ronald's father existed, wished to be responsible for the child, claimed that he would help with the boy's clothes, and stated his wife had deserted him.

In September, 1944, more correspondence came to light. A London official had reported in January, 1941, that the boy and his parents had been bombed out of their house and billeted in another part of London. The parents then disappeared, leaving the boy with the London billetor. He was subsequently evacuated with a party of schoolchildren.

Incidentally the father never sent any clothes, and the boy arrived in so ragged a condition in Somerset that his country foster-mother burnt the lot.

The boy was transferred from his billet to a hostel on 4.vii.44 and was seen by the Psychiatrist on 4.viii.44.

He gave a very circumstantial story of his London experiences. Asked about his mother, he stated that *the woman named on his identity card as his mother was not his real mother. His real mother got killed in the blitz. "We was bombed out and she was fast asleep. I was in the air raid shelter with my father; mother was there too. We got out before her; Dad got me out first; he*

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lifted me out of the front door of the shelter. Then he got out. A bomb landed when he got out. Then we ran away; we went straight across. We went back and she was dead. Shrapnel went through the middle of her stomach. The roof of the shelter was bent up. They buried her nearby. We went and found a billet about a mile away. We stayed with her a year. Daddy joined the Fire Brigade and lived with me. Then he found Mrs. R— (the name on the identity card) and went to live with her."

'Cos the blitzes got worse he was evacuated. Mrs. R—'s house was not damaged, only the windows down; he don't like blitzes at all.

In the four years he had been evacuated he had received no letters or parcels and had not been visited by either parent, Mrs. R—, or any other relation.

The Psychiatrist (F. B.) reported:

Either this boy has had a real emotional trauma in the air-raids, or else his emotional disturbance is so severe that it has produced this elaborate phantasy.

He attended the Somerset Child Guidance Clinic for treatment, and at his first session produced a drawing of a ship—Queen Mary, a common enough subject in boys of his age—but a remarkable detail was a diver underneath the ship attached by a life line and blowing a stream of bubbles. Asked his associations to the diver, he replied the diver in "Itma," the wireless programme, who it will be remembered appears sporadically during the programme, utters "Don't forget the Diver" and disappears again—a very apt delineation of the forgotten man (or boy). At subsequent sessions he drew a flagstaff with flag—he states flags are flown at school "when any person is dead."

He was fond of woodwork, and I noticed he seemed to enjoy the smell of glue, and tried to exploit his olfactory associations (14th session). The fish glue smell reminded him of fish and chips. He remembered being sent out by his father to get fish and chips. He could also remember buying percussion caps for his pistol. At the next session (15) I used a technique I have found useful in reviving old memories and encouraged him to draw a map of the road he lived in, putting in his own house, the shops, the cinema, the park, etc. He was able to fill in a good many details, including fish and chip shop, sweetshop, Woolworth's, church, clothiers, butcher, cobbler, underground station, bus stop, and remembered the number of the bus route.

In an early session (No. 7) he had stated that his mother had no time to play with him, never took him for a walk, but that she was never cross with him or hit him. After this reconstruction by map (Session 21.vi.45) he remembered that she was tall, dark, used to be cross with him when he went out in the rain and used to smack him.

In May, 1945, a letter was received from a Mrs. S— claiming she was Ronald's mother and asking for his return to her home in Suffolk. Further inquiries proved that she was formerly Mrs. R— (the person on Ronald's identity card). After her husband's death in the 1930's she had lived with Ronald's father, Mr. P—, who had deserted her at the time of the raids, taking Ronald with him. He had refused to tell her Ronald's whereabouts and had deserted Ronald, who had subsequently been evacuated by his billetor in 1940. Ronald was reluctant to believe that Mrs. R— was his mother (21st session). He claimed she was one of his billetors; he claimed that his mother was Mrs. P—, who had gone away and left him with his father, Mr. P—. He said he was placed with Mrs. R— by his father, that her house was a dirty place and he didn't like it at all. He thought he had been with Mrs. R— two years. But at the next session his own map of his London street was produced, and he agreed that this was where he lived with his mother, Mrs. R— and father, and remembered more details of the shelter arrangements, and remembered his father took him away from that home. Finally at the (25th) last session he produced a letter from his mother (now Mrs. S—), the first contact he had had in five years, inviting him to come and live with her in Suffolk. He was pleased and anxious to go back to her and ready to believe she really was his mother.

Discussion.

This boy's phantasy was a serious distortion of the facts. Actually his father had deserted him and his mother was alive. How had this distortion occurred? Reconstruction of the events suggest that at the age of 4 plus, when his identification with the father would be normally well developed, his father had taken him away from the mother. After air raid experiences of unknown severity, his father deserted him. But he was unwilling to give up his identification with the father hero. He had split up his mother into two components, a good mother with the same name as himself who he killed in an air raid—actually this phantasy suggests an elaboration of a parturition phantasy—and a "bad" mother, Mrs. R—, who had deserted him, and on whom he transferred his resentment at his father hero's desertion. For the good mother he flew a flag at half mast. The bad mother had dropped him overboard and left him forgotten, like the diver in deep water. But as his real memories as distinct from phantasies were recalled through the map technique, he was able to reintegrate them and finally accept the "bad" mother.

A somewhat similar case was Edward H— (18.i.36), seen first 23.viii.44, at the age of 8·7, and referred by a billeting officer because of alleged sex play with a little girl in his billet. He

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was examined by Miss Stephen, the County Psychologist, who reported that he had an I.Q. of 85; this estimate could not be considered absolutely accurate, as he appeared to be a very disturbed child.

He told the Psychologist (29.viii.44) that *he had been in the house with his mother and sister when it was bombed and that his mother's head was blown off, that he and his sister were hit in the leg, but that they picked the mother up and took her to hospital.*

He denied all sex play or exhibitionism firmly. He was seen by the Psychiatrist (5.ix.44) and told him the following story:

I lived at Downham in my own house; I got bombed out there. When the sirens went me and my big sister went to the shelter in the garden. It was night time. We picked up the dog and the kittens and took them down. The tom cat wouldn't come to the shelter. We heard a bang on the top of the shelter; I went out and we saw my little sister on the top of the shelter. She was killed. Mother was rushing down. Bomb hit her head on the forehead. It was bleeding. She was on the ground. It was dark. We had a torch. Mother was asleep; we tried to wake her up. Me and my sister picked her up. We went down the steps to the shelter. I held her feet, sister held her head; there were some bandages in the shelter. We bandaged her head; we thought she was alive. We was calling her. She wouldn't answer. We put her in the bunk. We lifted her head up and saw all the blood on the pillow. We screamed when we saw her dead. The house fell down when we got her in the shelter. When the "All clear" went, the bricks fell down and hit our legs. A bomb came down; bricks fell on her leg. Sister had both legs broken. I had a broken leg. I went up to police station. I only had one broken leg. I said me and my sister's got a broken leg. He 'phoned up the Coffin man. Coffin men came and took her (mother). I forget the place they took her to. Policeman 'phoned up the hospital. We didn't get bombed there. The cat got burned to bits, but we got to the shelter in time.

I have used the boy's actual words. Actually the sequence was very jumbled, but I have rearranged the order of sentences to give a consecutive narrative. If such a story had been true it is difficult to imagine a more traumatic experience for a boy of 4. If it was not true, the elaboration of such a phantasy indicated a very serious emotional disturbance.

We were fortunate in seeing the father on leave in December, 1944. He was a C.P.O. of many years' standing, in the Royal Navy and a good witness. He had obtained leave after the incident, visited his children in hospital and seen wardens and incident officers. He reported through Mrs. Sambrook, Assistant Psychologist, that during the raid the children were taken down to a shelter by a neighbour. The "All clear" had gone, the children came up and went home In all 11 people were in the house sitting round the table, while the mother was in the kitchenette getting tea. The house had a direct hit from a stray plane and 9 of the 11 were killed. The two children were the only survivors. The big sister of 17 had both legs broken, and Edward had a broken leg and a shrapnel wound in the forehead and was concussed and unconscious for a fortnight. An ambulance was on the spot at once, picked the children up, and took them to hospital. That night the hospital was bombed, but Edward was unconscious. Next day Edward was moved to another hospital, where he stayed two months. He was joined later by his sister.

Discussion.

In the light of this information it was possible to understand Edward's play, which had begun in November, 1944, with Mrs. Sambrook, under the direction of the Psychiatrist.

One of the main themes that kept recurring was a "tea party," which was observed 9 times in 17 play therapy sessions—obviously Edward was trying to reconstruct his last memories of the intact family.

Other incidents that occurred in his play were his comment on a "headless" woman figure, on a girl doll with a "broken" arm, a drawing of "armless" people. Radio sets were also a recurring theme. These he identified with their owners, some of whom were killed in the incident. Apparently the shelter he frequented in London had a radio and an electric fire. Both of these articles turned up in his play fairly often.

A considerable portion of his play time was taken up in water play with tubes and jets of water (12 sessions out of 17). This was obviously associated with his interest in his urinary excretion and was further associated with exhibitionistic tendencies, which were displayed in some remarkable drawings of a stage (6 sessions in all) in which much play was made of curtains being drawn and closed, and the objects on the stage were clearly "phallic" symbols. Associated with this activity was a good deal of play rehearsing bombing (5 sessions), and I came to the conclusion that his exhibitionism and sex play was also compulsive. That it seemed probable that just as he tried to reconstruct the family scene round the table, his last memory before the bomb fell, so his reconstruction of shelter life, with radio sets, electric fires, probably included sex play and exhibitionism, as it was clear that the children

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were sometimes left in the shelter by themselves. It seems probable that his guilt over the sex play and exhibitionism made him believe that the " loss of his family and his own injuries were a punishment for these practices." (*Vide* this phantasy of the *tom* cat that was burned ; he also told a long rambling story of a cruel butcher who killed a dog by hitting him on the head with an axe.)

His compulsive exhibitionism and sex play were, I think, motivated in a wish to prove that such practices were not invariably followed by disaster, and that he could not be held responsible for the death of his mother and relatives.

These phantasies have a close resemblance in the two examples quoted, though the first boy was of good average intelligence and the second boy was dull intellectually. In temperament, too, the boys differed, the first case showing a sturdy independence, the second boy being shy and withdrawn.

These two examples demonstrate how powerful are the internal emotional forces in the life of the child, and how they can use and distort the events in the child's external world to bolster up and justify the tendencies current at the particular phase of the child's inner life.

Unless social workers and welfare officers are alive to these possibilities of distortion from unconscious sources, they may possibly be misled seriously when dealing with children in their practical case-work in liberated areas.

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DEPRESSION IN PARKINSONISM TREATED BY PREFRONTAL LEUCOTOMY.

By E. SCHWARZ, M.D.Bonn, L.R.C.P.&S.
From the North Wales Counties Mental Hospital, Denbigh.

[Received April 7, 1945.]

THIS is a description of a case of depression associated with post-encephalitic Parkinsonism, with signs predominating on the left side, treated by unilateral (right) prefrontal leucotomy.

E. W—, aged 39, admitted as a voluntary patient to the North Wales Counties Mental Hospital on November 25, 1943.

Family history.—No evidence of mental instability. No familial diseases.

Personal history.—Normal birth. No delay in development. Happy childhood. Reached top standard in elementary school. Not a good mixer, but well liked. Steady worker (general labourer). No serious illnesses or accidents, except symptoms of silicosis when 24. Gave up work and symptoms cleared within a year.

History of present illness.—Changes as observed by family: When patient was 27 years old (1931) becoming moody, disinclined to converse, somewhat irritable, sleeping a lot, developing intermittent fine shaking of left arm.

When 29 (1933): Quite solitary; worked only under persuasion. Shaking of arm more severe and constant when awake; walked stiffly.

When 33 (1937): Had lost all interest in his family; careless in his dress; sleeping most of the day. Began to say that "everything was due to his having sinned."

Mental deterioration continued. Periods of relative wellbeing became shorter. Seemed continually worried. Conversation became monosyllabic. Lacked all initiative.

When 39 (1943): Tried to strangle himself on five or six occasions. Finally, when rejected for national service, cut his throat with a razor. Fortunately did not sever any important structures. His shaking "prevented him from doing the job properly." Admitted a few days later.

Examination on Admission.

A. *Physical condition.*—Average build; fairly well nourished. Facies immediately suggested Parkinsonian syndrome. Other obvious signs confined to left side of body. The following findings suggested post-encephalitic Parkinsonism:

Head: Held forward, inclined towards left shoulder. Constant fine horizontal tremor.

Eyes: Look straight ahead. Pupils dilated; blinking infrequent.

Face: Mask-like, but right side moves more freely than left. Rarely smiles.

Mouth: Held slightly open. Right angle drawn upwards.

Tongue: Tremor.

Speech: Slow, and voice monotonous.

Right arm: No tremor or rigidity.

Left arm: Adducted, flexed at elbow, forearm supinated. Metacarpo-phalangeal and interphalangeal joints slightly flexed. Thumb extended and adducted. Adiadochokinesia. Tremor of wrist and hand.

Body: Spine extended. Movements deliberate. Turns *en masse*.

Lower extremities: Walks rather stiffly, putting feet down somewhat heavily (right less so than left).

General observations: Rather slow in initiating movements, but not seriously incapacitated when at ease. Under stress tremor of left hand is very severe.

Reflexes: Both knee jerks very brisk. Pseudo-clonus both ankles. No other abnormal findings.

Other clinical and laboratory examinations.—No significant changes.

B. *Mental condition.*—Appears anxious, but can give a good account of himself. States that he has been depressed for about six years. Believes that his shaking is the result of an illness contracted as a punishment for sexual irregularities committed before he was married. His sins will be visited on his children, one of whom is about to develop an illness similar to his. There is no cure for him. He might as well die now. Complains of headaches and giddiness.

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Progress of case.—Settled down fairly well. Belladonna and hyoscine medication was tried but not "pushed" because his mental condition was unaffected and his physical disability was not, ordinarily, serious. General therapeutic measures were unsuccessful. Five months after admission he was still depressed and anxious, solitary in manner, lethargic, and his delusions persisted.

Electrical convulsion therapy.—A course of E.C.T. was commenced on April 22, 1944. After three convulsions he showed an apparently complete remission of mental symptoms. He relapsed within a week. One to three further convulsions brought about equally good and equally short-lived remissions. He was given a total of 16 applications, the last one on July 24, 1944.

After three months of treatment his condition was practically unchanged. He insisted on going home "to die" if nothing further could be done.

Prefrontal leucotomy.—The main reasons which seemed to justify an attempt to relieve his distress by this operation were:

(1) A history of long duration.
(2) A depressive state.
(3) The failure of more orthodox methods of treatment.
(4) The result of E.C.T., which had shown his capacity to remit.

In view of the fact that physical symptoms indicated that the left side of his brain had been chiefly affected by the encephalitic process, it was felt that it might be of interest to observe the result of operating on the right side only.

Operation of right prefrontal leucotomy.—This was carried out by Lieut.-Col. D. G. Duff, F.R.C.S., Consulting Surgeon, on 14.vii.44, after premedication with morphia gr. $\frac{1}{4}$ and hyoscine gr. $\frac{1}{100}$ under local anaesthesia.

On arrival at the theatre he appeared confused. He kept up a rambling conversation, but would not reply to direct questions. He looked around as if hallucinated.

The brain was approached through a trephine opening with its centre 3 cm. from the midline on the coronal suture. Operation aimed at cutting the white matter in a plane about $\frac{1}{2}$ in. in front of the anterior horn of the lateral ventricle. It was expected to cut close to, and even into, the grey matter overlying the orbital plate, and to sever all the fibres of (at least) the lower two-thirds of the right frontal lobe.

During the operation he remained confused, mildly restless and apparently unaware of what was happening. On inserting the leucotome the anterior horn of the lateral ventricle was punctured. The instrument was withdrawn and re-inserted further forward. No ill-effect seemed to result and the operation was completed.

No tremors were observed during the operation. Eight hours after its conclusion occasional involuntary movements of left wrist and hand reappeared. Head tremor was not observed again. Tremors of wrist and hand increased on the fourth day after operation, but amplitude and frequency remained much reduced.

Post-operative sedatives were used as follows: Inj. phenobarbiton ·2 gm. one hour and morphine $\frac{1}{4}$ gr. nine hours after operation. Inj. phenobarbiton ·2 gm. on the following day. Phenobarbiton orally, 1, 1, $\frac{1}{2}$ gr. *nocte* for three days.

Further progress.—This was uneventful, and could in no manner be distinguished from that observed in cases which had been subjected to bilateral operation.

Condition on discharge.—He left hospital on 18.ix.44, two months after operation. He was not anxious, not depressed, a reliable worker, and anxious to return home. He was somewhat unconcerned about his illness and the operation but not unduly cheerful. He mixed well. Ideas of sin persisted, but he stated that "he was not bothering about those things now." His shaking did not worry him and he felt he "had to put up with it." His headaches had "practically gone," and he did not remember having complained of dizziness.

Re-examination.—He was seen again on 11.xii.44, five months after operation.

Physical condition.—The change in his facial expression was striking. He laughed readily, his eyes did not "stare" and he blinked frequently. His mouth was kept closed. There was no tremor of the head.

His right cheek moved more freely than his left. There was a brief flutter of the eyelids on looking up, which had not been noticed before operation.

Tremor of left wrist and hand was not constant, and severe only on two occasions of severe emotional excitement during the interview.

Other signs, attitude, gait and neurological findings were unaltered.

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Mental condition.—Conversation was rational. He was aware of the implications of the operation, and satisfied that he was " his old self again." He was not depressed or anxious. He had obtained work, enjoyed his leisure, and appreciated his home life. His delusions of sin " had gone." He stated, " I am still shaking a bit, but that does not worry me, as I can again earn a living wage."

Commentary.—The determining indication for leucotomy in this case was depression, but the results have also to be considered in relation to the patient's Parkinsonian state.

Many attempts to relieve by operative measures the distressing symptoms of Parkinsonism have been made. They include sympathetic ramisectomy, rhizotomy, extirpation of the premotor area, cutting of fibres of the internal capsule, and removal of the head of the caudate nucleus.

In reviewing results of these measures, Meyers states that the findings raise more questions than they can answer. The same is felt in regard to results in this case, although the following questions appear to be the most pertinent:

(1) What was the relationship between the patient's depression and his Parkinsonism ? Was the depression psychogenic or was it due to organic changes in the brain ?

(2) Why was a remission of the depression obtained by a unilateral operation ? Freeman and Watts have stated that in their cases unilateral operation never resulted in recovery.

(3) How can the amelioration of physical symptoms be accounted for ? Is the diminution of anxiety brought about by operation sufficient to explain it, or must it be considered as due to interference with pathways between cortex and basal ganglia ?

I have to thank Dr. Roberts, Medical Superintendent, for permission to publish this case, and for his encouragement and helpful advice. I am also indebted to Prof. Golla for kindly bringing to my notice certain relevant literature, and to Dr. Duff for his description of the operative procedure.

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TWO YEARS' EXPERIENCE OF FEMALE SCHIZOPHRENICS TREATED BY INSULIN COMA THERAPY.

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AN Insulin Clinic for treating female schizophrenics by insulin coma therapy has been working now for over two years, and although it is too short a time to draw conclusions as to the ultimate benefit to the patient, some points may be of interest.

All patients treated were schizophrenics, i.e. they showed typical thought disorder, loss of memory or incongruous affective state, introversion and hallucinations. Many of the cases were marked by complete withdrawal from reality and confusion, so that 30 out of 86 were admitted as temporary patients.

In all cases the diagnosis was confirmed by at least one other opinion ; some of the cases who showed predominantly depressive signs had had E.C.T., which had ameliorated their depression and uncovered the underlying schizophrenia. (Cases 38, 72, 79, 84.)

Preliminary Investigation.

All patients had a general physical examination, investigation of urine, and a starving blood sugar estimation. At first a complete sugar tolerance curve was done in each case, but this was later discarded, since no conclusions could be drawn from it as to the individual reaction to insulin, and there was found to be no correlation between the curve and the amount of insulin necessary to produce coma. For example, Cases 13 and 39 had profound comas with 30 units of insulin, while Cases 20 and 51 needed over 200 units, yet all their blood-sugar curves were of much the same type.

Two cases were pregnant when treated. Many of the patients were in very poor physical health, in that they were emaciated and dehydrated, but provided the blood urea was normal and there was no actual organic disease, insulin therapy was started and pushed to the requisite coma stage, the patients showing very marked benefit physically. Each patient was weighed before starting treatment, and vitamins A, B and C were given concurrently with treatment.

Régime during Insulin Treatment.

Patients were treated in a dormitory by themselves. Those who were extremely restless or disturbed the others by wandering about were treated on mattresses in side rooms. The injections were given at 7.15 a.m. intramuscularly into the buttock, using ordinary insulin—40 units to the c.c. for small doses and 80 units to the c.c. for larger doses. Every effort was made to induce sleep and restfulness, curtains being drawn so that the light was dim, and the staff being particularly quiet so as to disturb the patients as little as possible. The patients wore flannelette suits, tying round wrists and ankles and buttoning up at the back ; these are particularly useful, as sweating is usually very profuse, and some patients are extremely restless, even when in coma.

The patients were starved from 7 o'clock the previous night. Sedatives at night or during the night are not contraindicated, but can usually be dispensed with after the first one or two comas. The initial dose given was 10 units, and the

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dose increased daily by 10 units till the coma dose was reached. The coma stage is judged to be reached when the patient is not rousable by ordinary stimuli, and when the normal plantar response is lost. This is usually preceded by profuse sweating and spasm of orbicularis oris and palpebrarum muscles, and often twitching of face and limbs. The coma stage was usually reached between 9.30 and 11 o'clock. Our régime, largely regulated by questions of staffing and the need to get the treatment finished by the ward dinner-time—12.30—was to give those who had not gone into coma glucose tea and potatoes at 11.30, and increase their dose next day by 10 units.

A chart was kept of each patient, on which was recorded a half-hourly pulse rate, the time of going into coma, the time of interruption and time of wakening. Unless there was any contraindication, each patient was left in coma for 30 minutes, then interrupted by passing a small nasal tube, size 10–12, drawing off the stomach contents with a glass syringe and testing against litmus, and giving 2 oz. of glucose dissolved in 8 oz. of weak tea without milk, down the tube. As a rule 2 oz. of glucose to 8 oz. of tea was given where the dose had been under 100 units, 3 oz. of glucose with a dose of between 100 and 150 units, and 4 oz. over 150 units; but this had occasionally to be varied to suit the individual needs and requirements of the patient.

When consciousness was regained, usually 15–30 minutes after interruption, the patients were propped up, wrapped in warm blankets and given 10 oz. of mashed potatoes with marmite; after which they were changed into warm dry clothes, stayed in bed until dinner-time at 12.30, then, if their mental state allowed, got up for the rest of the day. Before the coma dose was reached patients were interrupted by 2 oz. of glucose in milky tea, by mouth, followed by potatoes.

If, after interruption, any crisis arose, for example, delayed wakening over 45 minutes, with poor colour, and maybe irregularity of pulse, or abnormal frequency, 30–50 c.c. 33 per cent. glucose was given intravenously.

At 3 o'clock patients had a slice of bread and honey. This was found to be necessary, as many of the patients tended to get hypoglycaemic symptoms about that time—probably due to the small amount of glucose used for interruption. Tea was given at 5 and a light supper at 6.30. Nothing, except sedative when necessary, by the mouth until after treatment next morning.

Treatment was given on five days a week, with two rest days in between. This régime is not ideal, but has worked well, and has allowed us to carry on treatment fairly consistently under wartime difficulties of staffing and rationing.

Results of Treatment.

Number of patients completed treatment	86
,, ,, discharged	76
Discharge rate	approx. 88%

	Well.	Relapsed.	Not traced.
Discharged under 3 months	7	1	—
,, over 3 months and under 1 years	17	7	—
,, ,, 1 year and under 2 years	28	1	—
,, ,, 2 years and under 3 years	14	—	1

The average length of stay in hospital after starting treatment was approximately 17 weeks. The average total stay from admission to discharge was approximately 24 weeks. This latter is not felt to be quite a fair guide, as patients often had to wait before starting treatment, the numbers treated at one time having to be restricted owing to staffing difficulties. Ideally of course this would not occur.

Comparable Cases Admitted to this Hospital in 1939, Untreated.

52 cases; 25 discharged—approximately 48 per cent.

Length of hospitalization: 36 weeks.

Of the 25 discharged, 4 are known to be in hospital again, but no proper follow-up has been possible.

Most of the cases treated were those of acute onset, or of a short history, and had a relatively better prognosis and quicker recovery than those with a history of previous attack or long onset.

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Number of cases history under a year and first attack . . . . . 61 ; discharged, 54 ; relapsed, 3.
Average length of hospitalization after starting treatment . . . . 15·5 weeks.
,, total hospitalization . . . . 21 weeks.

Number of cases over a year, or with previous attack . . . . . 25 ; discharged, 22 ; relapsed, 6.
Average length of hospitalization after starting treatment . . . . 22 weeks.
,, total hospitalization . . . . 32 ,,

Relapsed Cases.

Of the cases which relapsed and are again in hospital :

CASE 26 relapsed 2 weeks after discharge and is still in hospital. She continues to have remissions of symptoms varying from half a day to two weeks, but otherwise is a typically hallucinated, impulsive, irrational schizophrenic.

CASE 58 relapsed after 8 months, but was never really satisfactory after discharge.

CASE 63 relapsed acutely after 4 months.

CASE 19 relapsed after 9 months, during which she had been at home and working.

CASE 12 relapsed after 5 months, during which she had been earning her living.

CASE 32 relapsed after 10 months, during which she had been earning her living.

CASE 37 relapsed after 10 months, during which she had been earning her living.

CASE 8 relapsed after 11 months, but was never satisfactory, and not well enough to work.

CASE 13 relapsed after 1 year and 8 months, but not working for the last ten months.

From this small number of figures it looks as though relapses are most likely to occur within the first year, which is what Wootton, Armstrong and Lilley found on investigating after-histories of patients discharged 1928–1931 (*Journ. Ment. Sci.*, January, 1935).

Coma Dose and Number of Comas.

The coma dose varied within very wide limits, the lowest in this series being 20 and the highest 250 units. It has been suggested that those taking a dose of over 120 units have a poor prognosis.

Number over 120 units, 29 ; discharged, 23 ; approximately 79 per cent.
Number under 120 units, 57 ; discharged, 53 ; approximately 93 per cent.

From these figures it seems that those needing the lower dose have a slightly better prognosis—but the chief thing is to induce a satisfactory coma.

Length of Treatment.

The number of comas varied with each patient and depended entirely on their mental improvement. I have come to the conclusion that patients who are going to respond to treatment give definite indication of this by the 25th coma, and then need a further 5–15 comas to stabilize them. Many patients respond much earlier than this, but there is a tendency to relapse if treatment is discontinued too soon.

There seems little to be gained by going on beyond 35–40 comas, unless for any special reason increased opportunity for readjusting the patient's attitude to reality during the post-coma stage is needed.

Cases having up to 15 comas, 21 ; discharged, 21 ; 100 per cent.
,, ,, ,, 30 ,, 34 ; ,, 30 ; approximately 88 per cent.
,, ,, ,, 40 ,, 21 ; ,, 17 ,, 81 ,,
,, ,, over 40 ,, 10 ; ,, 8 ,, 80 ,,

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Case 83 went through a mild manic phase after discontinuing treatment, but cleared up spontaneously in a few days. Cases 14 and 47 went through a marked paranoidal state towards the end of insulin treatment.

Cases 7, 9, 11, 21, 28, 30 and 49 cleared up slightly with insulin, but showed very definite schizophrenic reactions remaining, and gradually cleared up some months after treatment was discontinued. It is debatable whether the insulin treatment in these cases had any bearing on their recovery, but so far as they were improved, although not cured, after treatment I think it helped. Probably such cases need a prolonged time to adjust to, and be able to cope with, reality. Case 7 was in hospital for 3 years 8 months before treatment was given. During this time she showed no improvement, was withdrawn, resistive and impulsive. She improved considerably after insulin, and was discharged "recovered" 46 weeks after treatment.

Electrical Shock Therapy.

This was used in conjunction with insulin therapy in most cases, and was particularly useful towards the end and directly after insulin therapy was discontinued; often producing an alertness and urge to cope with reality, where before there had been dependency and a fear of facing responsibilities.

In some patients who had difficulty in facing reality, who were slow in action, wrapped up in fantasy, lethargic and difficult to get at, even in the post-coma stage, an electrically induced fit at the end of the 30 minutes' coma was definitely beneficial. The patients had the usual 30 minutes' coma, a fit during coma, and were then interrupted immediately in the usual way, but 5 oz. of glucose were given instead of the usual 2 oz. This was found most satisfactory, as many patients felt sick and unable to eat potatoes directly after recovering from E.C.T.

Spontaneous fits occurred in Cases 1, 3, 9, 13, 14, 21, 33, 45, 46, 49, 54, and 81. Those during pre-coma stage were ignored, if the patient's general condition was good. After a spontaneous fit in the coma stage the patient was usually interrupted immediately the convulsion had ceased. These spontaneous convulsions during coma had a definitely beneficial effect on the patient's mental state, and Case 81 made a complete and sustained recovery after having three spontaneous fits, one in the coma stage and two soon after interruption.

It is most necessary to stress the importance of treatment in the post-coma stage, when the patients are in an uninhibited state, in which they often will talk of worries and difficulties, some superficial, some deeper in origin, which they are unwilling or unable to exteriorize ordinarily. At these times much good can be done towards unravelling difficulties and combating false ideas.

The treatment calls for an intelligent, well-trained staff, and is necessarily one in which observation is called for all the time. It must be given with vigour and fortitude, both on the part of the staff and patient, if the best results are to be obtained, and it is essential that the patient should have a true coma. In my experience sub-coma doses have no effect on a true schizophrenic illness. One, Case 25, who had been treated with sub-coma doses for 7 weeks with no improvement whatever, recovered completely after 20 comas, and was discharged 6 weeks after starting treatment.

There were no fatal cases, and the patients without exception gained weight and were improved physically.

Cases 9, 63 and 69 had to be discontinued owing to persistent pyrexia following comas. They showed no signs or symptoms beyond the pyrexia; the temperature settled 4 to 7 days after cessation of insulin, only to rise again when coma treatment was restarted. Case 42 had a prolonged coma following electrical shock treatment while in coma. She remained in a deeply comatose state for 4 hours in spite of treatment, then gradually recovered consciousness, but was confused, restless and negativistic. Next day she was quite normal and rational, and remained so.

Cases 45 and 55 are of special interest in that both were pregnant—one 10 weeks and the other 14 weeks at the time of starting treatment. Neither showed any abnormal symptoms during treatment, and both have since had live children, with no recurrence of mental symptoms. The children, a girl, now aged 9 months, and a boy, now over 1 year old, are perfectly normal babies.

Cases 2, 24 and 57 have had confinements since discharge and have had no

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recurrence of mental symptoms, although the schizophrenic state for which they were treated followed childbirth.

Deductions and Comparison of Results.

A comparison of results of treated and untreated cases at this hospital shows a recovery-rate 40 per cent. higher in the treated cases, with a reduction in hospitalization of at least 12 weeks; moreover the relapse rate was lower in the treated cases—12 per cent. as against 16 per cent. untreated.

The number of cases studied is admittedly small, but shows an astounding similarity with over a thousand cases studied along similar lines in America.

What is the ultimate prognosis of these cases remains to be seen by longer follow-up, but the outstanding fact is that the recovery-rate can be considerably increased and the patients returned to be useful members of Society in an appreciably shorter time with this treatment.

I should like to thank Dr. Wootton for his co-operation, advice and permission to publish the cases, and especially to thank the nursing staff; the good results obtained are in a large measure due to their hard work and sympathetic understanding of the patients.

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LENGTH OF TREATMENT IN CHILD GUIDANCE CLINICS.*

By LAURA HUTTON, B.A., M.R.C.S., L.R.C.P.,
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FROM the point of view of the psychiatrist, if not from that of the general public, which still needs much education, Child Guidance Clinics have two quite distinct functions: one, diagnostic and advisory, the other, treatment by psychotherapy.

About the first, the diagnostic and advisory function, we all probably feel fairly satisfied. A team of workers gets together; a full and detailed picture of a child and its situation comes out as a result of the specialized investigations of each member of the team: the home and school reports from the psychiatric social worker, the report on the intelligence test from the psychologist, and the conclusions arrived at by the psychiatrist after seeing the patient and the escort. With all this before him, or her, the psychiatrist now feels in a position to diagnose and advise, to decide on the suitability or otherwise of the case for treatment, and to send out a full and constructive report to the person or authority who referred the child.

True, the problems presented may occasionally appear almost to defy solution, but as a general rule it is a very satisfactory situation, because everything one has in the way of scientific knowledge, practical experience and sympathetic intuition is challenged and called into action; and there is something to be done about it immediately: people to advise, decisions and arrangements to be made, and a full report to be sent out. Last, but not least, there is a freshness of interest, a new story to hear, new people to see, new problems to consider, new insights to appreciate. At the end of a diagnostic session one feels stimulated, full of energy and enthusiasm, convinced of the value of our work.

Perhaps some of you feel just as toned up at the end of every treatment session, but, judging by my own experience (and one usually finds that one's professional experience is much the same as one's colleagues'), there is not nearly the same exhilarating sense of a worth-while job adequately done after a morning or afternoon of treatment interviews. On the contrary, I think all psychiatrists must experience uncertainty, if not actual discouragement, during the course of treatments given in a Child Guidance Clinic. And the sense of inadequacy cannot all be laid at the door of poor conditions—premises, equipment and the like, although these are probably characteristic of most recently instituted Child Guidance Clinics.

That there is something amiss with the *treatment* given in these Clinics must from time to time be felt by all Child Guidance Psychiatrists, and particularly by those who have been trained in the school of adult analytical psychotherapy—the only really sound approach to child psychotherapy.

Leaving on one side the small children who take readily to play therapy, and the adolescents able and anxious to co-operate, there remains perhaps the largest class of patients—those between, say, 10 and 14. What happens in the half hour's treatment session with one of these? Many of them have no wish to do any expressional work. We have a friendly but more or less shy child (for he or she only sees the doctor for half an hour once a week), and a doctor all out to make conversation. How difficult it is to avoid an endless series of questions, politely answered by the child! And so the interview closes. And the next one is a week away. Is anything being done at all? one cannot help asking oneself. Even if the half hour is spent in painting or modelling or woodwork, it is only sometimes that it seems to be getting one anywhere beyond giving the child half an hour's freedom to do what he wants, away from the drive of school.

After many weeks a review is made, and inquiries instituted, and it appears that something has been done. A child who couldn't learn has begun to learn. Even nocturnal enuresis has become very slightly less constant. But is it justifiable to spend so much time for so small a return? It is all very unsatisfactory

* Read at a meeting of the R.M.P.A. Child Psychiatry Sub-Committee on February 6, 1945.

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and very unsatisfying. And it becomes very tempting to try more aggressive methods, to be more directly educational and evangelistic, with the hope of forcing a cure, and shortening the length of treatment.

And why not ? would be the immediate reply of those not trained in analytical schools of psychotherapy. It is true that such an approach, made with sufficient confidence, may be spectacularly successful within a short time in some cases. Successful, that is to say, from the point of view of removal of the symptom, temporarily, at least. For I think it is pretty generally recognized that patients " cured " as the result of evangelistic methods do tend to relapse, or to produce fresh symptoms. And further, one cannot help feeling that other people, without any knowledge of depth psychology, but with far greater experience than most of us in the day by day handling of these same children, would be as well if not better equipped to " treat " our patients along such aggressive lines than we are. What have we to offer that they lack, except a theoretical knowledge of how our patients' symptoms may have arisen?

Personally, I would say that where one feels that direct educational or evangelistic methods are what are required, the case is not one for treatment at a Child Guidance Clinic, but should be referred to teachers, club leaders or ministers of religion, for the help that these people should be well fitted to give. But here I am touching on the problem of the selection of cases for treatment at a Child Guidance Clinic—a subject to which I want to give more consideration later on.

To turn to the more specific consideration of the problem defined in the title of my paper—length of treatment.

Those of us who have been trained in analytical schools of psychotherapy, whether through our own analysis alone, or in work with adults as well, tend to think of psychological treatment as a lengthy process, with hardly worked-for and slowly achieved results, the goal being an adjusted personality, rather than the removal of symptoms. This is a very sound attitude, and one which should never be lost sight of, if our work is to be scientific. But it needs review, and it may be modification in Child Guidance work, especially under present conditions.

First of all, I should like to bring forward some points justifying lengthy treatment in child psychotherapy.

Although, as I said earlier, one often has, at the end of a diagnostic interview, a most satisfactory feeling that one is seeing a pretty complete picture of a problem, and that one has an idea what should be done about it, there are other occasions when one is much less sure about the completeness of the picture. There is a sense of missing clues. For the psychological situation in a Child Guidance case is likely to be very complex, and it often takes time to discover more obscure, but nevertheless essential factors in it ; and still more time to bring these factors to light, in such a way as to enable those concerned, and especially the patient, to understand them and profit by their understanding. In the first interview Dennis could only account for his intention to disappear from home—he had packed his suitcase, and left a note for his parents—by saying that he " could not go on." It took a number of treatment interviews to learn that the apparently reasonable and co-operative mother, interviewed by both psychiatric social worker and doctor, was a neurotic moral blackmailer, intent on possessing her only child body and soul, from whom in desperation he had to flee. The realization of this situation immediately involves the prospect of a lengthy treatment if it is to result in a genuine freedom for the boy from such a powerful, although unbearable, tie.

Another situation involving lengthy treatment is the following: A child's problem is frequently almost exclusively determined by his environment, which may be unalterable, in spite of the best efforts of the Child Guidance Clinic. In such cases it may be that the best help that can be given to the child is regular personal contact spread over a long time, to enable him to keep on tolerable terms with the disadvantageous environment, and to help him not to manifest his really quite justifiable resentment through antisocial behaviour. This kind of prolonged, regular personal contact, not necessarily involving any particular effort to probe the child's Unconscious, is specially indicated in the case of homeless and perpetually institutionalized children, to whom the personal individual interest of the psychiatrist is of immense significance, although the relationship may appear to the doctor to have very little of intimacy in it. Dickie is a child of this kind. He has lived all his life in Public Assistance homes, and has been described as "the most detached

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child I have ever met." He is a chronic enuretic and thief. After many months of weekly interviews, part of the routine of which has been the regular supply by the doctor of buns—bagsful of buns—Dickie seems to have reached a personal relationship with the doctor of about the level of that between an eighteen months old child and his mother—the age of foraging in Mother's handbag. It is a very primitive sort of relationship, but it does just exist. And Dickie's thieving has definitely decreased. It may certainly be objected that this kind of " treatment " is waste of the psychiatrist's time, and could be carried out by any lay person. But where and how could such " treatment " be arranged ? The sort of godmother known as " my lady " arranged for in some children's homes is the nearest substitute, but is not easy to find ; and, if found, is likely to be too anxious to do good to her protégé to give him quite the sort of security he needs. (I always remember the remark made to me by a patient to whom I shall be referring later : " If *you* ever became good, I should have to murder you.")

Again, the child, as compared with the adult, is inevitably undergoing rapid mental, emotional, as well as physical change, particularly during the years of adolescence. Where there is special difficulty, from within or from without, which, one may assume, is always the case in children brought to a Child Guidance Clinic, it is often important to keep in touch with a patient for years, until some stabilization is achieved, and/or freedom from a crippling environment is attained. I saw the boy I quoted just now from the age of 14 to nearly 19, and I am sure it was quite essential to do so. He was brought because of his parents' fear that he would commit suicide in his despair after one of his frequently recurring " brain storms." Weekly, sometimes bi-weekly, interviews over a period of nearly five years saw him through school-leaving and his first job without disaster, in spite of the lurid material produced, including a potential murder (not of me). Whether he is still outside a mental hospital, I don't know. Being nineteen at the outbreak of war, he may no longer be alive. And in view of his paranoid tendencies, the fact that he revealed to me the whole of his guilt-laden fantasy life, that we never fully analysed the negative transference, and that he is a potential murderer, I have hesitated to send a follow-up inquiry.

In a much smaller number of cases than those I have already described there is a profound neurotic or pre-psychotic disturbance, recognized at the diagnostic interview, and clearly requiring *deep* psychotherapy. This must inevitably be very prolonged, and it is in these cases particularly that the impracticability, as a rule, of holding more than, at the outside, two treatment sessions a week lengthens treatment beyond what under more favourable circumstances would be necessary. Not only is it lengthened in time, but the actual number of interviews is inevitably increased, because of the resistance to the revelation of repressed material built up in the intervening days.

In this justification of lengthy treatments, it will be noted that I do not by long treatment necessarily imply deep therapy, in spite of my earlier association of the analytical approach with lengthy treatment. This illustrates the suggestion I have made that the analytical attitude may need modification in Child Guidance work, and further illustrations will follow.

I fear, however, that we must all admit that there is often a tendency to prolong treatments beyond a useful or really justifiable limit, in view of waiting lists. But indeed it is often extraordinarily difficult to decide when to make an end. In work with children, with the exception sometimes of the more intelligent adolescents, we set out without the conscious co-operation of the patient—often with his conscious antagonism. To the child we probably only gradually become distinguished from the other controlling and critical adults of his environment. That is to say, it takes a considerable time even to create a setting in which treatment can really begin, although it is no doubt justifiable to describe this preliminary establishment of a favourable transference situation—practically ready-made in adult psychotherapy—as part of the treatment.

Again, waiting lists, school claims, cost of fares, escort problems, all combine to limit most treatments to half an hour a week, which, in effect, means a totally inadequate handling of the case ; and this inadequate, actually incorrect, handling of our cases inevitably results in the prolongation of treatment, thus in turn intensifying the problems of waiting lists, school claims, cost of fares and escort's time. It is a vicious circle and all most disheartening. But what is the solution ?

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It is impossible to refuse the demand for our work by such drastic limitation of the numbers of children treated as would result if we insisted on seeing each patient at least three times a week. As things are at present, I do not see the solution in that direction, even though such a decision would actually be in accordance with our scientific convictions and our clinical experience. There appears to be no immediate solution to this problem.

However, Child Guidance work is still so much in the experimental stage that we must expect queries to be much more in evidence than answers, and problems much more clearly defined than their solutions.

Nevertheless we must attempt to find some solutions to these problems of necessary and unnecessary length in treatment, if our work is not to become disappointing both to ourselves and to the interested general public, and even to fall into disrepute.

In this connexion two aspects of the work seem to me to be worth consideration and discussion :

(1) The selection of cases for psychotherapy.
(2) Modifications of technique in treatment.

First, as to the selection of cases ; from the point of view of the general public, practically every case referred to a Child Guidance Clinic is a case for treatment. The backward child, the enuretic, the truant, the pilferer, the difficult defiant child—in each case it is felt that " that child needs psychological treatment." There is, unfortunately, always a tendency, once a new mode of coping with a difficult situation is accepted, to look to that mode as a solution for every problem. The Clinics themselves are not blameless in this matter, for in the early months or years of a Clinic's history there is a tendency to accept as a case for treatment nearly every child referred, with the exception of the out-and-out M.D.'s—provided the treatment can be arranged. The same thing happens, and probably rightly, in the early experience of the psychiatrist. It takes time and experience to prove the uselessness of attempting to treat certain types of case. Clinics for adult patients have had to make the same discovery, and some of you may remember an interesting paper in the *Lancet* by Dr. Mary Luff of the Tavistock Clinic, written nearly ten years ago, on the types of adult psychological patients who are hopelessly resistant to psychotherapy. Her categories do not apply in child psychiatry, but I should say that more cases, unsuitable for treatment, are referred to Child Guidance Clinics than are referred to Clinics for adult patients, such as the Tavistock Clinic.

One category of unsuitable child patients has been definitely recognized, and that is the mental defective, and, to some extent, the markedly dull and backward. But there is another large group of children which I feel has not yet been clearly enough recognized and defined, and that is the congenital psychopaths. There is no doubt in my mind that after the largest class of all, the children whose problems are really mainly environmental, the majority of the remaining cases referred are children with psychopathic personalities, though perhaps this is more characteristics of clinics like the one I work in, founded originally to cope with the unbilletable evacuee. By a psychopathic personality I mean a child whose behaviour abnormalities are not so much a reaction to a particularly difficult environment, nor the manifestation of a neurosis arising in the course of the child's emotional development, but are the expression of a congenital, inherited character structure or orientation. It is impossible to go further into the nature of the psychopathic personality here, but for a most stimulating discussion, classification and description of the various types, I would refer you to Dr. van der Hoop's book, *Conscious Orientation*, which I had the privilege of translating just before the war. It is published by Kegan Paul. Many of the children whose moral values Dr. Strauss recently described as " Satanic " are, I surmise, congenital psychopaths. These children are bound to cause intolerable difficulty to their environment—especially when away from home—and so they are handed on to the Child Guidance Clinic. The adult psychopath, if his oddity does not bring him up against the law, is not likely to present himself before the psychiatrist, for, unlike the neurotic, he is usually unaware of his abnormality. And, moreover, adults are not usually brought to a doctor, or would be willing to come, on account of behaviour peculiarities.

Some psychopathic personalities are no doubt partly the product of specially pernicious environmental influences, for example, the permanently institutionalized.

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In such cases, like that of the boy Dickie I described just now, psychotherapy of a specially adapted kind may be of value, but it really represents more of an attempt to modify the environment than to treat the child. Otherwise, in most cases of psychopathic personality I should be inclined to the opinion that treatment should be environmental alone—designed rather to protect the child, and counteract the manifestations of his abnormal attitude to life—than psychotherapeutic, where the aim is to modify the personality itself. The congenital psychopath, if and when recognized, is, I believe, resistant to ordinary psychotherapeutic methods, and cannot be expected to respond to them, at any rate when applied for only one half hour a week, which is all that is usually practicable. Attempts at deep therapy may in fact be definitely harmful.

If, however, it seems quite impossible to alter the environment in the child's favour, then it may be justifiable to take him on for treatment by psychotherapy for a limited period only, recognizing the fact that this step is more likely to benefit the psychiatrist, by adding to his experience and insight, than to do much for the child.

Another consideration which, under present circumstances, may justifiably be taken into account, when deciding whether or not to take a child on for treatment, is his potential value to society. Is it right to take on for prolonged treatment children who, from a physiological, sociological, as well as a psychological point of view, are " poor material "? Such children need *so much more* than a weekly half hour with a psychiatrist, and not that, nor all the friendly and enthusiastic efforts of the psychiatric social worker, can be expected to make good their deficiencies.

I had such a case recently, an adolescent girl, whose symptom of faecal incontinence at work was the expression of anxiety which had been chronic and crippling from a very early age. According to the mother's story, it appeared to have been precipitated by a bungled tonsillectomy at two years of age. But Peggy was a poor thing in every way, the whole history and social picture being characteristic of an inadequate response to life. Her I.Q. was, I think, 84. In such a case one felt one had to offer treatment for such an embarrassing symptom, but I took her on with the intention in my own mind of limiting the time of treatment, and I modified my approach accordingly. Circumstances also helped me, in that the symptom compelled a change of work, in view of the complaints of Peggy's workmates, and under the conditions of her new employment, she felt much less stress of anxiety. I discharged her as soon as there was a sufficiently good response to ensure at least temporary satisfaction, and the good repute of the Clinic.

It must be understood that these suggestions as to the limitation of the cases taken on for treatment are made largely on grounds of expediency, and are not dictated, as ideally they should be, by scientific or even empirical reasoning. In these pioneer days of child psychiatry, the psychiatrist could no doubt learn much that was valuable from the attempt to treat every case that presented itself for diagnosis and advice, even if he never got very far in regard to removal of symptoms or adjustment of the personality. But while Child Guidance Clinics and Child Psychiatrists are as scarce as they are these days, waiting lists will grow to grotesque lengths, and our work be reduced to absurdity, unless we do learn to practise a pretty severe selection of cases for treatment. However much it may go against the grain of the confirmed analyst, we have to learn to make use of every possible alternative to psychiatric treatment, in the way of attempts to modify the environment, and to be ready to call in the help of other less scientific, but still indirectly psychotherapeutic agencies, such as Scouts, youth clubs, even riding schools and dog kennels.

To bring this question of the selection of cases for treatment to a head, and with a view to inviting criticism and discussion, I would say that, on the whole, I would limit my treatment cases to—

(1) Cases of definite neurosis, including neurotic anxiety, in patients of good psychological stamina, as evidenced by the early history.

(2) Cases suggesting the imminence of a pre-psychotic breakdown.

(3) Co-operative and intelligent adolescents.

(4) Children whose symptoms appear to be the direct result of harmful institutionalization, where *individual* therapy of almost any kind is urgently needed.

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Cases falling under these heads, with the exception of the prepsychotics, seem to offer some prospect of real response to treatment, while in the case of the prepsychotics, I feel that some attempt at treatment must be made, because of the disaster which one sees looming ahead.

To turn to the question of technique in relation to length of treatment. I have already stated what I feel about what I called the evangelistic technique, which seeks to force a cure, to impose it from without, rather than to elicit it by removing the deep cause of the trouble. I have also tried to explain the necessity for lengthy treatment in certain types of case, which I may here recapitulate:

(1) Where the diagnostic interview and investigations have failed to find all the clues to the child's problem. Here, of course, the finding of the missing clues in subsequent interviews may serve to shorten treatment. The point is rather that where one feels one has not got a complete picture, the prognosis as to length of treatment must be indefinite. And occasionally the finding of a missing clue may make it obvious that a longer course of treatment will be required than one had at first considered necessary. Such has been the case with my patient Dennis.

(2) Cases of unalterably crippling environment, which, however, time *will* ultimately remove. Here the technique need not be analytical. The Clinic situation in itself, the individual relationship between patient and doctor is, even on conscious levels, the therapeutic agent.

(3) During the difficult years of adolescence. This might almost be regarded as a special instance of the unalterably crippling environment, except that the difficulties come more especially from within. And the technique here must probably be more personal in its approach, and may involve some depth analysis. But it is surprising how far one can get on a basis of shared interests, informally discussed.

In the case of the last two classes, one must often think of treatment in terms of years. But on the whole I would say that whenever a child is taken on for psychotherapeutic treatment, that treatment, to be really effective and worth while, is likely to be protracted—to last, say, at least a year—under present conditions, that is to say, the weekly half-hour interview.

(4) The cases clearly demanding deep therapy, which must always be lengthy.

But there are certain cases and situations where treatment may be justifiably shortened if one keeps the total situation of the child—that is to say, his external, as well as his internal circumstances—under constant review.

For instance, sometimes it can be seen that a child's difficult behaviour or neurotic reaction has been called forth by a situation which is merely temporary. George, for example, was behaving quite intolerably at home with his new stepmother. His antagonism to her was intense, and quite undeserved, as far as one could see. Later it became clear that neighbours disapproved of his father's second marriage, and had expressed their views without restraint in the boy's presence; and that it was this influence which had largely prompted his behaviour to his stepmother. Temporary removal of the boy to a hostel, and the clarifying of this situation, soon removed his antagonism, and further treatment seemed unnecessary.

In other cases treatment can be closed when the child's external circumstances undergo a marked change, and it is possible to foresee a consequent lessening of emotional tensions—for example, on leaving school. So many of a child's difficulties are the result of dominating and unsympathetic attitudes on the part of those—parents and teachers chiefly—to whom he remains first and foremost a child to be managed, and not a person to be understood. When he goes out to work, the pressure of attitudes like these is much less likely to be in evidence, and the patient is freed from many of the incentives which formerly prompted his difficult behaviour.

In deciding to end treatment in the light of external circumstances after only a short course, it is, of course, necessary to use considerable judgment, and to weigh up one advantage against another. It may be clear that longer treatment would be likely to procure a better result. But the present conditions of our work, and the claims of other patients, make it right to take advantage of our patient's changed and more favourable circumstances, and to discharge him, although it may mean foregoing a result more satisfying to our clinical standards.

Where such somewhat premature closing of a case is decided on, there is need for

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special care in dealing with the patient's transference to the psychiatrist. Transference problems are only seldom obtrusive in Child Guidance work, as carried on at present, but there must always be a transference situation; and, as in work with adults, it is always the most important and dynamic force in the treatment, even when unrecognized.

Sometimes it is possible to take advantage of an opportunity to hand on a positive transference to someone else, for example, a club leader, with whose help the child may carry on the work of personal adjustment, begun in the Child Guidance Clinic.

But in any case one may always maintain the possibility of continuing the relationship with the patient, by making it possible for him to return with any future problem which may turn up. An expression of continued interest in the patient's life and progress may mean a very great deal to him, in the transition period between treatment and the establishment of solid relationships and satisfactions in his changed circumstances. Follow-up inquiries may also be fitted into this conception of the transference situation as a dynamic force in the adjustment of the patient to life and reality, if they are made personal and informal, and not allowed to bear any evidence of having been sent out, along with others, from an office by a secretary.

Before I close, I feel I must really apologize very humbly for the vague, discouraging, and often trite remarks which I have made. But they come from a sense of pressing need to clarify some of the unsatisfactoriness of Child Guidance work, where treatment is concerned. I have returned to psychotherapy after three years' practical work in semi-rural general practice, and the contrast between the realization of needs, urgent needs, that can be met, and the resulting sense of achievement in the latter kind of work, as compared with the disbelief in the worth whileness of Child Guidance work so often expressed by the very people who are most concerned with our patients—teachers particularly—and our own failure to achieve any very definite results—this contrast I have found depressing and disturbing, in spite of the fact that it is also a challenge. Hence this paper, written with the heartfelt hope that it will promote a practical discussion, in which other Child Guidance psychiatrists will be as frank and as unafraid of apparent truisms as I have sought to be.

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A SYNDROME ASSOCIATED WITH LEFT HAND PARALYSIS OF CENTRAL ORIGIN.

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CERTAIN disturbances of a higher order, e.g. aphasia and agnosia, follow as a rule a lesion of the left hemisphere in right-handed persons and vice versa. This dominance of one hemisphere for certain functions has been well established from abundant material. The Gerstmann Syndrome, recently studied, seems to obey the same rule of dominance; other disorders, such as the attitude toward paralysed limbs and defective functions, appear to be caused by lesions of the non-dominant hemisphere. The relations of the latter group, however, to the hemisphere cannot be regarded as firmly established, since the material presented is still limited.

A syndrome with left hand dysfunction of a peculiar order as the outstanding feature is here described, which is not altogether in agreement with the observations concerning hemispherical dominance. An attempt is made in analysing the syndrome to discuss in relation to it the question of dominance.

The patient, aged 68, formerly a school mistress, said to be very capable and well educated, was admitted to Bristol Mental Hospital on December 17, 1944, having spent the preceding weeks in a nursing home. The reports from this home and from her relatives state that the patient in October, 1944, had a "stroke," followed by a left-sided hemiplegia. She became restless and sleepless, difficult to manage, was destructive, appeared to be disorientated, was very talkative, and was accordingly transferred to this hospital. Inquiries from both patient and relatives left no doubt that she was a right-handed person, and there is no family history whatever of left-handedness.

When examined on admission she showed a weakness in the left orbicularis oculi muscle and a more pronounced weakness of the muscles supplied by the left third branch of the facial nerve, a slight reduction in the muscular power of the left shoulder and left elbow-joint, and complete paralysis of left wrist and fingers, which were both held in plantar flexion. There were no active movements in the hand or fingers. There was very slightly diminished muscular power in the left leg, while all active movements were present, and she dragged it slightly when walking. There was complete loss of touch and pain sensation in the left fingers and hand up to the wrist; from wrist upwards these sensations gradually improved and were almost normal from the elbow upward, normal in the remaining parts of the body. There was a complete loss of position sense in the fingers and wrist; that of the other joints of the body was unimpaired. The deep reflexes were slightly increased on the left side, and there was a left-sided homonymous hemianopia of the lower quadrant. The interossei and to a slighter degree the thenar muscles of the left hand were atrophic. Electrical reactions did not show R.D. in the atrophic muscles. The blood pressure was 185/90 mm. Hg.

A survey of her mental picture and intelligence was carried out. Special tests showed that her logical powers were well preserved. Her conclusions, solutions of comparisons and abstract thinking were very good. She spoke fluently, her understanding was unimpaired and her speech resources were excellent. Her memory was patchy, showing a marked confusional disturbance in the time order of events, recent and remote. Retention was fairly good. She had a tendency to become emotional, was garrulous and self-distractible, making it difficult at times to hold her attention for a long period.

She showed at first a slight uncertainty in spatial orientation, and had temporarily some difficulty in finding her way about the ward. She remembered and described familiar routes well. Estimation of relative and absolute distances was

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unaffected. Her body and left-right orientation, excluding the hand, was prompt and faultless. She showed no agnosia for objects, real or pictorial, and was able to interpret situations. Her reading was fluent and without error, but she occasionally lost the line, apparently because of her hemianopia. Her writing was perfect. She handled all objects well with her right, undamaged hand, and she was able to make appropriate expressive movements with it.

The following disorders were found:

(1) *Acalculia.*—Her attempt to solve simple sums was very slow and uncertain, and she made frequent mistakes. Slightly more complicated sums proved too difficult. When asked to solve written problems in multiplication and division she became very confused, uncertain of the method, the position of the figures and ordinary simple procedure.

(2) *Constructional disturbance.*—Drawing and other constructive tasks, e.g. building with wooden blocks, were grossly disordered. This was demonstrated by memory and copying tests with geometric figures and object drawing. Her drawings were completely confused, and showed no constructional coherence; the final picture was often quite unrecognizable. When asked to draw a face she put eyes, ears, nose and mouth in the wrong places. Her attempt at drawing a hand was particularly bad. She had no idea where to put the fingers, and the resulting picture was completely formless. These findings become more significant when the patient's previous history is considered. She was very fond of painting, and was apparently very skilful with her hands.

(3) *Disturbance of left hand representation.*—When the patient was asked to point to specific fingers on her left hand she was unable to do so. She could not name left hand fingers by sight or touch, and had some difficulty in naming single fingers of the examiner's hand. Testing of her right hand showed a similar disturbance, which was slight and occasional, occurring only at the beginning of our examinations.

(4) *Inability to distinguish between left hand and the examiner's hand.*—The most bizarre behaviour was noted when the patient was shown simultaneously her left hand and the examiner's hand. She was never certain when any of the fingers thus exposed was pointed out to her whether this particular finger belonged to her own hand or to that of another person. At her best she was very uncertain, saying, "I think it belongs to me." The examiner's fingers were usually put with their tips pointing towards and touching those of the patient, so that it seemed impossible that a mistake could be made. But even when the hand was put at some distance from her own she was incapable of differentiating the two hands or the fingers. When under such conditions she was asked what criterion she had for distinguishing the two pairs of hands or fingers, she usually answered, "Because I can feel it." Nevertheless she did not make the correct choice. She even shook the finger of the examiner's hand, lifting it from the table, stating, "It is my hand; I feel it." When touching her left with her right hand she suddenly said, "This is not mine; this is yours." She made, occasionally, similar mistakes with the right hand when persistent testing of her left hand had made her somewhat confused. The findings for the hand as a whole were similar to those for the fingers. When asked to follow up the hand to the wrist with her right hand, she was able to correct her mistake only on coming into contact with the examiner's sleeve or her own clothing.

In the early stages of investigation she had the greatest difficulty in describing the hand or its parts and the relations between the various parts. She stated on some occasions that the individual fingers were connected with each other by a joint; on other occasions she seemed to have no clear idea how the fingers were joined to the remaining part of the hand. These difficulties were present at a time when description of other parts of the body and of objects was quite satisfactory. At a later period of investigation this descriptive disturbance gradually disappeared.

(5) *Abnormal attitude towards defect.*—From the beginning the patient belittled the disability of her left hand. She persistently maintained that there was not much wrong with it and that her movements were not too bad, although at this period she could not move her hand and fingers at all. She believed that it was a broken bone which caused the trouble, and explained that she fell vaulting a stile while in the country. Later she attributed her injury to an accident while riding a bicycle. She actually had a similar accident seven years before, which had caused a Colles' fracture. Facial asymmetry was marked because of drooping of

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the angle of the mouth and weakness in the left orbicularis oculi, but she was unable to find anything strange in her face when shown a mirror.

(6) *Unawareness of eye in function.*—She was unable to say, when one of her eyes was passively closed, which one was open and which shut. When the left eye was closed and she was asked which eye was open she sometimes said " both eyes " ; at other times " the right." She frequently thought the left eye was open when it was closed. Such mistakes occurred less often with the right eye.

All these examinations were checked frequently, and no change could be discovered for several weeks. Very gradual improvement then took place, but after six months' of observation the disturbances associated with the left hand could still be demonstrated.

Discussion.

The following signs and symptoms in a right-handed patient were found: almost complete paralysis of the left wrist and fingers with only slight paresis of the remaining part of the left side of the body, a similar distribution of superficial and deep sensory loss on the left side, atrophy of the small hand muscles on the left, left-sided homonymous hemianopia in the lower quadrant, a disorder on the left side of finger-agnostic type with some peculiar features, a marked constructional disturbance, difficulties in calculation, poor appreciation of the functional defect in the left hand and fingers, a personality change with a childish, uncritical attitude, gross memory defect in which the defective chronology of events was predominant. Intelligence tests were well performed.

When the symptoms obviously relating to the left hand are considered, a marked finger agnosia as well as a coarse functional loss is observed. The finger agnosia is apparently only part of a more extensive disorder, which we will attempt to analyse. It seems clear that the patient's inability to differentiate the fingers on her left hand arises from a very vague and poor conception of the relationship of the various parts to one another. It may be partly due to this misconception that the patient is incapable of making the correct choice between her own and a foreign hand when they are simultaneously exposed. But her difficulty remains when the actual position should exclude any doubt, and when the two hands are separated by a considerable space. Under these conditions the patient becomes progressively more confused, and is finally unable to give a clear answer. She is apparently unable to use intervening space and the natural attachment of the hand to the body as a means of distinguishing between her own body and space. It would appear, therefore, that there is no longer any definite borderline between body and space where the left hand is concerned, and that this hand has become a vague entity swaying about with no fixed starting-point, detached from the body. This reaction is reminiscent of experiences encountered in phantom limb phenomena in so far as our patient fails, under the above conditions, to recognize her hand as part of her body and regards a strange hand as her own. It is very likely that an element of such disturbance is present in our patient, but it is not the response usually observed when the body scheme is disturbed. We note that her confusion appears only under certain test conditions. She is always aware of her left hand, and has no difficulty in locating it when questioned in the course of her ordinary daily activities and when her own body sphere only is involved. An indication of this is also given by her general attitude toward the defects ; there is no tendency to eliminate the useless organ from her body scheme, but, on the contrary, she maintains that there is nothing much wrong with her hand. All these observations indicate that under uncomplicated conditions the hand maintains its proper place in the body scheme.

Undoubtedly the reactions under consideration contain a strong visual-agnostic factor, represented by lack of recognition and differentiation, which is consistent with the finger agnosia as described as the nucleus of the Gerstmann syndrome. Considering the associated acalculia and constructive disorders we might well speak of a Gerstmann syndrome in this case. Various categorical disorders have been advanced as an explanation. The agnostic factor observed could account for the difficulties in finger differentiation as well as for the constructional disturbance. But our patient was also unable to make this distinction by touch, and there is still a spatial factor unaccounted for, which could be held responsible for part of the patient's reactions. The disorders in hand and fingers are almost exclusively

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restricted to the left hand, so it is difficult to see how the disturbance of a specific function could explain this exclusiveness. The obvious fact is that the paralysed, atrophic left hand, deprived of all its functions, has more or less lost its symbolic representation and, whatever discriminating mechanism is used by the patient with regard to her left hand, she is unable to incorporate its inherent qualities in the general mental process. The hand thus becomes for the patient an almost unspecific, amorphous organ, largely de-differentiated without proper co-ordination with the rest of the body.

As pointed out in the introduction, the syndrome connected with finger agnosia is considered to be due to a lesion of the dominant hemisphere. Many observations have been published, and there is very little recorded in the literature which might contradict this view (Gerstmann, Klein, Lange, Schilder, Wagner a.o.). A case of Hermann and Poetzel, an ambidexter, in which a lesion of the otherwise non-dominant hemisphere produced a Gerstmann syndrome, is thus not in disagreement with the generally accepted opinion. The only case we could find in the literature which in our opinion does not quite agree is Case 5 out of a collection of cases by Nielson. This case showed, after recovery from a left-sided hemi-paresis in a right-handed patient, some degree of finger agnosia and finger aphasia, especially of the left hand. The patient also had constructive apraxia, was unable to draw, had allaesthesia and dysaesthesia on the left side with loss of sense of touch. The author postulates in his case, apart from a right-sided lesion in the centrum semi-ovale, another lesion in the left parieto-occipital region. The latter he assumes because of the presence of finger apraxia, finger agnosia and constructive apraxia, although nothing else in the neurological findings supports this view. Nielson considers apparently the fixation of these disorders to the dominant hemisphere as an indisputable fact.

This case has much in common with our own with regard to the question of dominant and non-dominant hemisphere where finger agnosia and related symptoms are concerned. Several interpretations for both these cases are possible. In the first place it may be, as some observations on the pathology of higher functions suggest, a splitting up of certain higher functions, which are then taken over by the otherwise non-dominant hemisphere. The constructional disorder could thus be due to the right-sided lesion. Secondly, the fact must be considered that, apart from signs of a local lesion, disturbances of a generalized nature also occur in the majority of cases presenting such symptoms. We know that such generalized processes may cause loss of particular functions, whilst others are still preserved. In cases where local and generalized processes coincide, it is, therefore, difficult to decide which signs and symptoms to attribute to the one and which to attribute to the other. In our case such coincidence certainly exists. The acalculia, which as part of the Gerstmann syndrome is considered to be due to a local lesion, could be produced by general lowering of the brain function, as difficulties in calculations in such processes are a common finding. Experience shows that constructive disorders may occur at a fairly early stage of general disintegration, and it is, therefore, difficult to estimate how big a factor the generalized disturbance may have been in our case.

The disturbances, however, among them the finger agnosia, which are almost exclusively associated with the left hand, can neither be explained by a shift of function to the right hemisphere, nor can they be related to the left hemisphere, nor can they be due to a general brain process. They point without any doubt to the localized lesion in the right hemisphere which put the left hand out of action. The neurological signs indicate that the parietal region is involved. This observation shows that a right-sided localized brain lesion in a right-handed person may affect the left hand, and this hand alone, as a functional and representational organ even at high levels of integration.

In contrast to the disorders just discussed, the uncritical attitude of our patient toward the paralysed left hand seems to be in accordance with the general experience in lesions of the non-dominant hemisphere. This interesting peculiarity in her attitude is to be noted; not only are the actual happenings preceding and immediately following her acute illness—the "stroke" and her confinement to bed—completely extinguished from her memory, but a minor accident occurring seven years before, which involved the same hand, has been transferred to the recent past so that the patient refers to this minor accident as the real cause of her

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disability. Thus she belittles by this mental mechanism the severity of the lesion.

Finally, we wish to refer again to our patient's difficulty in stating which eye was open and which closed, when these movements were passively performed. L. H. Rubinstein made somewhat similar observations on one eyelid, relating them to the unawareness of paralysed limbs. In our case we have the impression that the failure consists mainly in correlating the visual fields to the eye in function, and suspect that the hemianopia may be the decisive factor.

Summary.

In an outspoken right-handed person a right-sided brain lesion, probably in the parietal region, produced a left-sided hemi-paresis in which the hand and fingers were almost completely paralysed, with atrophy of the small hand muscles, sensory loss in the hand and fingers, finger agnosia, difficulties in distinguishing the left hand and fingers from those of someone else, and in recognizing these as part of herself under test conditions. A disintegration has thus been found in the functional as well as in the representational sphere, whereby the left hand has lost for the patient more or less the characteristics of a specific organ. Constructional disturbances, acalculia, malappreciation of the defective function were associated with this disorder; personality and memory defects were present. The problem of dominant and non-dominant hemisphere has been discussed.

We wish to thank Dr. Hemphill, Medical Superintendent, for his interest and advice.

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THE STARCROSS READING BOARD: A DYNAMIC AID TO READING.

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ON studying the behaviour of mental defectives one cannot fail to note that their deficiency is not confined to the intellectual or emotional plane. They are clumsy not only in their way of thinking and reasoning, but also in their bodily movements. Their muscular co-ordination and their manual dexterity are poor; they are awkward in their rhythmic work, and they rarely reach average standard at games. Their ocular movements show much the same shortcomings. They are sluggish at following a moving object with the eyes, they easily lose sight of the finger which they should fixate, and they are equally clumsy when they are called upon to look at will at an object in the fringe of their visual field. In some feeble-minded defectives of medium or even higher grades this inability may be clearly reminiscent of motor apraxia in other spheres of neuro-muscular functioning. More often than not precisely these patients are found to be particularly backward readers, able to decipher short words only and incapable of grasping the meaning of a printed sentence.

These observations have been the starting-point for the elaboration of the Starcross Reading Board as a dynamic aid to reading. The Reading Board consists of a cardboard or plywood sheet 14 by 11 in. It is painted white and slotted by ten or twelve rows of horizontal lines as would be printed on a book page. The slots serve as leads for a sliding rod carrying a disc, which moves along them and is operated behind the board by the teacher. The discs carry the moving object, upon which the child has to focus his attention, inducing him to follow it with his eyes along the " lines " of the reading board. One side of the disc may carry the picture of a simple object, e.g. a bird. The disc is hinged on the upper end of the rod, and can be turned to its reverse side by a quick jerk of the teacher's hand. Its reverse side indicates the name of the picture shown in print, e.g. *bird*.

The child thus receives (1) a visual impression of the picture, (2) a visual impression of the corresponding word, and he is called upon to follow them with his eyes from the left to the right and from line to line much in the same fashion in which he has to learn to pursue the (static) pattern of words on a printed page. The teacher, seated behind the board, is in turn able to watch through the slots the eye movements of his pupil, to note when his attention flags, when he loses hold of the moving word or object, and to correct such shortcomings.

I may add a brief remark on the rationale of the method. I mentioned that it aims at encouraging the dynamic (motor) side of the reading process as opposed to its static (perceptual) side, which has so far been the only function to be systematically trained by the orthodox methods of teaching. But the fact is that both motor and sensory functions are inextricably fused in the complex automatism of reading, and it can well be assumed that the neglect of the former may be responsible for the deadlock reached by many backward readers who are unable to proceed beyond the stage of reading isolated words only, corresponding to Burt's six or seven year level of reading.

The Reading Board has been used at our Special School during the past year by our teaching staff, and it is too early to try to assess the results achieved. However, I learn from our headmaster, Mr. R. Ward, that the method seems to promote

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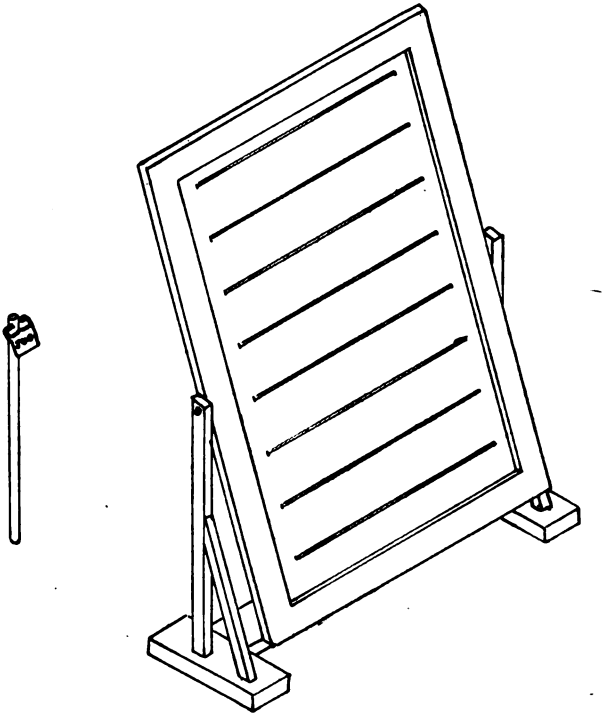
visual attention, that it stimulates the interest of the pupil, as is shown by the better retention of the word patterns presented on the Reading Board as compared with words presented in the ordinary way. At the same time it appears to be conducive to greater fluency of reading at a later stage, and thus to help towards a better



progress of backward readers. This impression has also been confirmed by our head mistress, Miss I. D. Hall. Future experience will have to show whether it is of value as a preparatory method of teaching to read in children of normal intelligence on the infants' school level. I have to add here that reading disabilities of the type of pure word-blindness, based as they are on a disorder of a prevailingly sensory nature, do not seem to respond to the method described.

I wish to thank Miss I. D. Hall and Mr. R. Ward for their valuable advice and assistance, and for their interest taken in the work with the Reading Board.

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Part II.—Reviews.

Les gliomes de l'encéphale. Étude anatomo-clinique publiée avec le concours de la Fondation Universitaire de Belgique. By JACQUES DE BUSSCHER and H. J. SCHERER. L'édition universelle, S.A. Bruxelles, 1942.

This is the first volume of a comprehensive treatise on cerebral gliomas. It contains three chapters, the first giving an *exposé* of the general methods and problems, the second dealing with cerebral astrocytoma, and the third with the oligodendro-astrocytoma of the septum pellucidum.

The views of the authors (de Busscher used to attend frequently meetings of the Royal Medico-Psychological Association before the war) are well known through numerous previous publications on the subject, and English readers have at their disposal the excellent critical review which Scherer published in the *Journal of Neurology and Psychiatry* in 1940. A brief outline of the contents of the present volume is, therefore, sufficient.

The classification of cerebral gliomas advocated by Cushing and Bailey was, in the main, based on a cytogenic principle. This is rejected by the authors, who employ what they call a "complete" or "dynamic" method based on a full consideration of all available clinical data, and a comprehensive pathological investigation which is not confined to the usual examination of a small area of the tumour, and which aims at an exhaustive histological analysis of the tumour and its relation to the rest of the brain. From the point of view of their "dynamic" method it appears that of all the types of glioma described by Cushing and Bailey and subsequent workers, only the medulloblastoma is a clinico-pathological entity. The astrocytomas are not a local phenomenon, but always primarily diffuse gliomatous overgrowths. Oligodendrogliomas may be a histogenic, but certainly not a clinico-pathological entity. The intraventricular tumour of which they give an example in the third chapter is a morbid entity, although it consists of two cytological components (oligodendroglioma and astrocytoma).

To the psychiatrist it is of interest to note the importance of nervous and mental symptoms occurring during the early and later stages of the diffuse cerebral astrocytomatosis. In the case of the intraventricular oligodendro-astrocytoma the severe mental changes are attributed to the affection of the corpus callosum.

The review of the literature is complete. A large number of good photomicrographic illustrations are added in a small separate volume.

In the introduction to the book the authors give an interesting comparative analysis of trends and facilities for neurological research in various countries. The high esteem for neurological institutions in this country is certainly gratifying to the British reader, and this, combined with a rather outspoken criticism of recent German publications, testifies to the courage of the Belgian authors, who published this volume during the time of the German occupation of their country.

A. MEYER.

Mental Abnormality and Crime. English Studies in Criminal Science, Vol. 8. Edited by L. RADZINOWICZ and J. W. C. TURNER. London: MacMillan & Co., Ltd., 1944. Pp. xxiv + 316. Price 18s.

The relationship between mental abnormality and crime is beset with unresolved problems. No adverse criticism of these important essays is intended if it is said that many more questions are raised than solved. The contributors are all well-known psychiatric experts and, in the various sections, this large and very difficult subject is viewed from a variety of aspects. As a whole the consensus of opinion is a conservative if not sombre one.

Dr. MacNiven ("Psychoses and Criminal Responsibility"), in a masterly critique of the McNaghten Rules, concludes that, in our present state of ignorance, it is probably wise to leave well alone, since the criterion of criminal responsibility "is capable of such wide interpretation, and the law is administered in such a liberal and humane manner, that no injustice results." Dr. MacNiven, however, does support those who would introduce an intermediate verdict, but this should be formulated: "If he was not insane, has it nevertheless been proved to the satisfaction of the jury that his crime was unrelated to his mental disorder?"

Dr. Pearce and Dr. Miller ("Certain Aspects of Juvenile Delinquency") are able to be a little more optimistic. The former discusses the role of constitutional handicaps, such as physical disabilities and intellectual inferiority; the latter the influence of bad family and social environment. Dr. Miller also provides an interesting chapter on the effect of place in family. He finds the evidence contradictory.

Prof. Henderson, discussing the psychopathic constitution, states that at one time he considered the sexual offender as a purely medical question, but that experience has altered his opinion. He finds that in only a few cases can sexual offence be linked up with mental disease. It is suggested that here Prof. Henderson strikes at the root of the difficulty. The scientifically trained physician is inclined to equate crime with anti-social behaviour; he then postulates

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that anti-social behaviour must result from an abnormal mind; finally he equates mental abnormality with mental disorder, which in its turn only differs quantitatively from insanity. These identifications are at best only part truths, and lead to many pitfalls in practice.

Other chapters deal with crime in relation to the psycho-neuroses (R. D. Gillespie); mental deficiency (E. O. Lewis); injury (D. R. MacCalman); physical factors (W. Norwood East); alcoholism (G. M. Scott); sexual offenders (W. Norwood East); military life (G. de M. Rudolf). E. Glover discusses the diagnosis and treatment of delinquency, and R. N. Craig reports on the work of the Exeter Child Guidance Clinic.

This book should find a place in the reference library of every mental hospital. It is recommended to the notice of all psychiatrists. S. M. COLEMAN.

Psychology and Psychotherapy. By WILLIAM BROWN. Fifth edition. London: Edward Arnold & Co., 1944. Pp. viii + 223. Price 14s.

In the majority of chapters there are only minor alterations for this new edition. Two new chapters have been added and an appendix deleted. One of the new chapters is concerned with the control of sex, the other with the psychology of modern Germany and of Hitler in particular.

In Hitler, William Brown finds evidence of the paranoid personality type and of hysterical dissociation. He regards Hitler as a medico-psychological problem, *Mein Kampf* being the "book of words" of his delusional system. He is of the opinion that German psychiatrists should have dealt with him in the early years, or at least sounded a word of warning.

Dr. MacNiven, in the book reviewed above, reminds us that "the difference between normal and abnormal mental functioning is quantitative, not qualitative," and in the latter "nothing new is added to it (the mind), and everything arises from material already there." Hysterical and paranoid mechanisms are the common property of mankind, the normal, the subnormal, the mentally disordered, the criminal or the tyrant. Given that in this particular tyrant, paranoid and hysterical mechanisms are conspicuous, is it reasonable therefore to regard the tyrant as mentally disordered? It is contended that on a balance of character traits, Hitler would not conform to any of the recognized forms of mental disorder. On the contrary, he shows characteristics which are practically never found among the mentally disordered. To take another group of abnormals, about whom we know rather more, the mass-murderers; they have been found to be, with a few exceptions, without evidence of mental disorder and fully responsible.

In the chapter on sex-control the author does not show very much sympathy for the erring ways of less fortunate men. He states bluntly that the instinct can and must be controlled. "You can say 'No' to it once and for all."

More humane psychiatrists may still prefer to remind their distressed patients of the tolerant and kindly advice ascribed to a Jewish insurgent. S. M. COLEMAN.

Manual of Psychological Medicine. By A. F. TREDGOLD, M.D., F.R.C.P. London: Baillière, Tindall & Cox, 1945. Second edition. Pp. xi + 308. Price 18s.

This small book for the use of practitioners and students states the views of the author, who is consulting physician to University College Hospital. The second edition has been carefully revised and brought up to date.

We do not like the use of the word amentia—to avoid confusion the word oligophrenia is much to be preferred. In Holland, for instance, amentia means confusional insanity, and in Italy "amenza" similarly means confusional insanity—although British writers and abstracters do not always appear to be aware of this.

In view of the fact that the book is meant for practitioners and students, and therefore not for psychiatrists, we think that the paragraphs dealing with electric shock therapy and prefrontal leucotomy might have been greatly extended. These are both very much in the mind of relatives to-day, and they want to be informed by the family doctor what it is all about.

G. W. T. H. FLEMING.

Text-book of Medicine. Edited by J. J. CONYBEARE, M.D., F.R.C.P. Seventh edition. Edinburgh: E. & S. Livingstone, Ltd., 1945. Pp. 1164. Price 30s.

The section dealing with psychological medicine in this standard text-book of medicine is written by Dr. Desmond Curran and Dr. E. Guttmann. So long as there are text-books on psychological medicine we fail to see the necessity for including a section on this subject in a text-book of medicine—it is neither fish, fowl, nor good red herring. To crush psychological medicine into 100 pages condenses it far too much for any student or general practitioner to derive much benefit therefrom.

The section is very well done, and we congratulate the authors on their condensation, especially after they have pointed out in their preamble that the magnitude of the problem confronting psychiatry reaches dimensions comparable with that presented by general medicine as a whole!

In discussing aetiology the authors point out that there are always psychological factors, physical factors and constitutional factors to be considered in every patient.

When *will* someone produce statistics showing how many people having an insane heredity, and being overburdened with psychological and physical factors, still remain perfectly normal mentally? It is an interesting problem.

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The chapter dealing with symptoms is particularly well done. The patient's description (p. 993) of a drawing as a sample of neologisms is strangely reminiscent of James Joyce's *Finnegan's Wake* or the *Mime of Mick, Nick and the Maggies*!

We would like to see the reasons given for certifying a patient arranged in a different order, giving *treatment* pride of place. G. W. T. H. FLEMING.

Acute Injuries of the Head. By G. F. ROWBOTHAM, F.R.C.S. Second edition. Edinburgh: E. & S. Livingstone, Ltd., 1945. Pp. 424. Price 30s.

This is an extraordinarily good book, well written and well produced. It is difficult to pick out any one chapter for special praise; they are all very well done. The author very wisely emphasizes the importance of rehabilitation, and nowhere is this more important than in brain injuries, especially if mental symptoms have been prominent. We should like to see included in the next edition a chapter by a psychiatrist dealing with the psychological problems arising from acute head injuries and their treatment, including rehabilitation aspects.

The illustrations—there are more than two hundred—are practically all of them new, and the author is to be congratulated on a magnificent display. G. W. T. H. FLEMING.

Recent Advances in Neurology and Neuropsychiatry. By W. RUSSELL BRAIN, D.M., F.R.C.P., and E. B. STRAUSS, D.M., F.R.C.P. Fifth edition. London: J. & A. Churchill, Ltd., 1945. Pp. 363 + 32 illustrations. Price 18s.

This is not strictly the fifth edition—it is really the first edition of *Recent Advances in Neurology and Neuropsychiatry*. The previous four editions were those of *Recent Advances in Neurology*. The neurology of to-day is becoming so much a question of neuro-surgery that the neurologists must find it difficult to produce any "recent advances" without invading the territory of the neuro-surgeon or, for that matter, of the neurophysiologist.

The book is very well done; the chapter dealing with electroencephalography is one of the best in the book.

In summing up their views on prefrontal leucotomy the authors take the still rather widespread pessimistic view that "when other forms of treatment have been tried and failed prefrontal leucotomy is justifiable if the prospect of the relief of anxiety after being weighed against the possible post-operative effects is acceptable to the patient, his relatives or the institutional authorities responsible for his welfare." We wonder how many other forms of treatment in medicine are so grudgingly employed—when the results are so good!

G. W. T. H. FLEMING.

The Examination of Reflexes. By R. WARTENBERG, M.D. Chicago: The Year Book Publishers, 1945. Pp. 222. Price $2.50.

This small book is composed of articles that appeared in the *Archives of Neurology and Psychiatry* during 1944.

The author points out how many a reflex has been "discovered" by one author after another, each one anxious to attach his name to a "new" reflex, at the same time completely neglecting the work of his predecessors—"There is nothing new save that which has been forgotten."

The author works systematically through the following twenty-four reflexes: Orbicularis oculi, jaw, head retraction, finger flexor, hand flexor, finger-thumb, pronator, brachioradial, Babinski inversion of radial, biceps, triceps, paradoxic triceps, pectoral, scapulohumeral, abdominal skin, abdominal muscle, quadriceps, leg adductor, biceps femoris, semitendinosus and semimembranosus, knee flexor, triceps surae, plantar muscle, and distant toe flexor.

He discusses all the variations, the physiology and pathology of these reflexes, and provides the reader with a list of 465 references. To those interested in neurophysiology this will prove a most fascinating and at the same time instructive book. G. W. T. H. FLEMING.

The Treatment of Mental Disorders. By R. EAGER, *O.B.E.*, M.D. Exeter: W. H. Cole & Son, 1945. Pp. 100.

This very interesting small book is written to commemorate the centenary of the building of the Devon County Lunatic Asylum in 1845, and is written largely for the layman. It consists of Part I, a history of the treatment of mental disorders from an early age, Part II, the history of the Devon County Mental Hospital, and Part III, general conditions and modern methods of treatment.

We would like to have seen some mention of the founding of the Medico-Psychological Association, which has done so much to promote the treatment and welfare of the mentally ill.

We would like to point out that the word "McNaghten" in the McNaghten ruling is spelt with an "e" and not with an "o," and that if the author will refer to the article on prefrontal leucotomy in the Special Number of the *Journal of Mental Science* for January, 1944, p. 486, he will find that the first prefrontal leucotomy in Great Britain was performed at the Burden Neurological Institute, Bristol, on December 11, 1940, and *not* in 1936.

G. W. T. H. FLEMING.

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* A number of extracts in this section are reproduced from *Chemical Abstracts* and *Psychological Abstracts*. To the Editors of these Journals we extend our grateful thanks.

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General Paresis in Senility.

General paresis occurs in senility with considerable frequency. In the State of New York, about 10 per cent. of paretics admitted for the first time to state hospitals are 60 years old or more.

The incubation of the senile type of paresis is generally either extremely long (40–50 years), or rather short (5–7 years). The diagnosis is often made difficult by the fact that the blood serology is negative, in spite of the progress of the histologic inflammatory process.

Pathologic investigations revealed that these cases may be divided into two groups: the first group, by far less common, characterized by intense inflammatory changes, presence of alterations typical of senility, and absence of arteriosclerotic lesions; the second group characterized by milder inflammatory changes, absence of alterations typical of senility, and the almost constant presence of arteriosclerotic lesions.

Study of the interrelations between the paretic process, cerebral arteriosclerosis, and senility, seems to indicate that (1) the neuroluetic inflammatory process may have an inhibitory influence upon the neuropathologic changes of senility. On the other hand the senile process may have a stimulating influence upon the neuroluetic inflammation. (2) Neurolues may accelerate the arteriosclerotic process of the brain. Cerebral arteriosclerotic changes in turn may tend to diminish the intensity of the inflammatory process. (Author's abstr.)

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Metrazol and Electric Convulsive Therapy of the Affective Psychoses: A Controlled Series of Observations Covering a Period of Five Years.

1. The benefits of convulsive therapy of the affective psychoses are to be gaged by the reduced period of illness and the greater number of recoveries. The latter effect is due to the decreased number of deaths rather than to any inherent greater therapeutic effect. The treatment in itself is not responsible for any greater incidence of recovery than that which occurs spontaneously if the patient is shielded from death by suicide or exhaustion.

2. The known hazards of treatment for treated patients are less than the hazards for untreated patients. In this study 13 died as a result either of suicide or of exhaustion.

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3. Subconvulsive doses, incomplete therapy and old age are unfavorable factors. Subconvulsive reactions should be avoided.

4. The tendency to recurrences or to new attacks is apparently not influenced by treatment.

5. The possibility of damage to the brain still calls for quantitative evaluation. A margin of safety may be found.

6. This study presents an equal number of control (untreated) and treated patients. More such studies are needed in order to solve adequately the problem of the effect of convulsive therapy of the affective psychoses. (Authors' abstr.)

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Edema and Trophic Disturbances of the Lower Extremities Complicating Prefrontal Lobotomy.

Of the authors' series of 19 prefrontal lobotomies, 2 died, and of the remaining 17, 8 have presented complications referable to both legs and feet. Six had bilateral oedema, in 4 of whom the oedema was associated with tenderness. The authors are unable to offer an explanation for a phenomenon which Freeman does not mention in his book on Psychosurgery. They think there may be areas in the brain lesions of which produce oedema and vascular and trophic disturbances. G. W. T. H. FLEMING.

Origin of the Spike and Wave Pattern of Petit Mal *Epilepsy: An Electroencephalographic Study.*

The post-operative records of 2 patients with nearly complete section of the corpus callosum show "*petit mal*" sequences displaying a simultaneous onset in bilaterally symmetric leads. Since conduction between the two hemispheres *via* axon paths in the corpus callosum has been destroyed, the existence of a cortical focus cannot be assumed in these particular patients. It is most likely that in the records of patients without section of the corpus callosum in which a similar simultaneous onset was displayed, conduction of the signal did not occur through the corpus callosum, and that the source of this signal was subcortical in these patients, as well as in the patients subjected to operation.

The thalamus or the hypothalamus is considered as a tentative site for the pacemaker of the spike and wave complex. (Author's abstr.)

Electroencephalographic Study of Prefrontal Lobotomy: A Study of Focal Brain Injury.

1. The primary electroencephalographic response of the human brain to localized injury (prefrontal lobotomy) is the production of focal slow waves. These may or may not persist.

2. With lobotomized patients the return of the electroencephalic pattern to a relatively normal pattern usually requires one to three months.

3. Certain persons show no demonstrable response to cerebral injury under the conditions of these experiments.

4. A representative group of subjects show apparent normal early recovery, and then again exhibit grossly abnormal variations in potential in the region of the original injury. At times the abnormality may be general.

5. Hyperventilation after cerebral injury induces pronounced slow wave activity in brains that before injury were uninfluenced by a similar procedure.

6. Of the present group of 30 patients, 1 had clinically recognized convulsions.

7. The aforementioned phenomena are general and thus apply to injury to the brain from other traumatic agents. (Author's abstr.)

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Bromine Content of the Blood in Mental Diseases. I. *Dementia Precox.*

The average bromine content of the blood of 172 patients with dementia precox was found to be 0·555 mg. of bromine per hundred cubic centimeters of blood. It is significant that the values for 80·2 per cent. of the patients examined varied from the average (0·555 mg.) by less than 0·2 mgm. The average value for the patients with dementia precox was lower than the average obtained by the same method for normal persons residing in the same city.

(Authors' abstr.)

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Graphological Analysis and Psychiatry: An Experimental Study.

The handwritings of fifty neurotic male Service patients at Mill Hill Emergency Hospital were analyzed by a graphologist, and checked in a variety of ways against various personality indices. These included a personality analysis and diagnosis by the psychiatrist in charge of the case, a history of the neurotic illness of the patient, the patient's answers on a personality inventory administered personally, and the results of an intelligence test. The following results were arrived at, and the following conclusions drawn:

1. Out of 1,350 judgments by the graphologist, concerning certain points of the patients' temperament and personality, 62 per cent. ± 1·4 per cent. S.E. were correct, as checked against the patients' own answers. (Chance expectation = 50 per cent.)

2. Out of 152 judgments by the graphologist on which she felt particularly confident, 68 per cent. ± 3·5 per cent. S.E. were correct. (Chance expectation = 50 per cent.)

3. The graphologist did not succeed in predicting the intelligence gradings of the patients, with the exception of those with very superior intelligence.

4. Persons tend to differ consistently with regard to the ease with which their handwriting can be diagnosed.

5. Traits differ with regard to the ease with which their presence or absence may be detected from handwritings.

6. The graphologist succeeded in matching character sketches of the patients, and other material, against their handwritings, the average coefficient of contingency being 0·46 for ten five-by-five matchings.

7. Psychiatrists did not match character sketches written by the graphologist on the basis of the patients' handwriting with the actual personalities of the patients with better-than-chance success.

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8. Ten psychologists and psychiatrists with no, or very little, knowledge of graphology matched character sketches and handwritings with rather less-than-chance success.

9. Taken together, these results seem to show fairly conclusively that it is possible for a skilled graphologist to diagnose personality traits from handwriting with better-than-chance success.

10. Further progress in this field seems to depend largely on the close collaboration of graphologists and psychologists. (Author's abstr.)

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The Relationship between Vocabulary Levels and Levels of General Intelligence in Psychotic and Non-Psychotic Individuals of a Wide Age-range.

The Wechsler-Bellevue test scores and the Form L vocabulary of the 1937 Terman and Merrill Revision of the Binet test were given to 268 patients in a state hospital. The ages of the subjects ranged from 15 to 69. The IQ's indicated by the two tests gave a correlation of $r = .78$. Discrepancies between the two scores were studied. The vocabulary test over-estimates the intellectual level (*i.e.*, gives higher scores than the Bellevue test), the differences being smallest at the teen-age level and largest at the old-age level. All the psychopathological groups showed greater IQ discrepancies in favor of vocabulary scores than did the non-psychotic group, but little difference was noted between the several diagnostic groups, and the magnitude of the discrepancy was not clearly related to the severity of the type of mental condition.

E. B. MALLORY (Psychol. Abstr.).

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Problem Solution by Monkeys following Bilateral Removal of the Prefrontal Areas. V. Spatial Delayed Reactions.

1. Twelve rhesus monkeys, six normal animals and six which had been subjected to bilateral prefrontal lobectomy, were tested on spatial delayed reactions, using a direct method.

2. Two of the operated monkeys solved 20 sec. (or longer) delayed reactions, performances comparable to the best of the normal animals. The other four operated monkeys adapted poorly to the delayed reaction tests.

3. The performance of monkeys following extensive bilateral lesions of the prefrontal association areas appears to be influenced by the length of the post-operative recovery period, previous test history, and extent of the lesion within the prefrontal areas.

4. It is suggested that monkeys, following destruction of the prefrontal association areas, suffer deficit in attending and fixating limited aspects of a test situation, and that this operates to reduce the effectiveness of the acquisition of complex problems such as the delayed reaction run by the direct method. (Authors' abstr.)

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Electroencephalographic Recordings of Varying Aspects of Attention in Relation to Behavior.

There has been the attempt to correlate various phases of attention with brain-wave patterns through a spectral analysis of the EEG drawn off from the various brain-regions. In particular the authors have been occupied with the differences in brain-wave pattern where (*a*) an individual's attention is preoccupied with affective, socially disjunctive elements (ditention),

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and (*b*) where the attention is free of these impediments, and functions in alignment with the organism's basic motivation as a whole (cotention). Our data show that in cotention, as compared with ditention, there is a marked drop of energy-output in the 8–12 and 2–40 frequency-ranges, and that this drop is registered predominantly in the motor regions. Intense attention (mental work), on the other hand, did not bring about a consistent change of energy-output. Further series in which the subject read in the two attentive phases substantiated the difference in the two brain-wave patterns. There was a pronounced drop in energy-output for reading in cotention as compared with reading in attention.

The technique of cotention possesses clinical value in eliminating the bias of affect from the process of attention. In the cotentive constellation the organism's primary pattern of tension tends to promote a more balanced relationship between organism and environment. In particular, cotention insures the individual's healthier social interrelations in place of the muddled relationships too often existing in social groups due to the conditioning affects inseparable from man's ditentive behavior. (Authors' abstr.)

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Infantile Amaurotic Family Idiocy.

It is concluded that, as in Addison's disease and perhaps Graves' disease, in amaurotic idiocy the primary factor is a lack of adrenal medulla. This in its turn gives rise to prematurity of the gonads, degeneration of the interstitial cells (puberty gland), relative hyperplasia of the thymus and increase of colloid in the thyroid. The constellation of the endocrines is considered in relation to asthenia observed in this disease. S. M. COLEMAN.

The Panoramic Position of Psychiatry: 1 and 2.

Fifty years ago, in a civilization of fixed and stable values, hysterical reactions were a common defence mechanism. Investigating these states, Freud pointed the royal road to the unconscious by the interpretation of dreams. Now, in a changed *milieu*, in which the unconscious is overwhelming conscious values and the social order, emotional illness has changed from "la belle indifférence" of the hysteric to anxiety itself or even panic reactions. In facing new problems many have deflected from psychoanalysis proper, seeking aid from socio-anthropological psychology, religio-occult psychology, psychosomatic medicine, psychotherapy and shock therapy.
S. M. COLEMAN.

Hebephrenic Fancies.

A psychoanalytical interpretation of the fancies of two hebephrenic patients supports the view that delusional elaboration is often an attempt to create a defence against committing the two basic crimes of mankind, incest and parricide. S. M. COLEMAN.

Green Ink.

Males who chose to use green ink, taken as a group, appear to be unduly dependent on the mother or mother-substitute. Many marry a woman older than themselves. The use of green ink is an attempt at compensation—that is, an expression of individuality and independence.
S. M. COLEMAN.

DECEMBER.

*The Psychiatric Sequelae of Post-Measles Encephalitis. *Smith, E. C., and Trapp, C. E.* 555
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The Dilemma of the Aetiological Concepts of Mental and Organic Disease. *Perlson, J.* . 606

Sequelae of Post-Measles Encephalitis.

In a series of 21 cases of measles encephalitis at least 8 patients showed subsequent personality changes besides some form of neurological sequelae. Personality changes included irritability, emotionalism, disobedience, as well as a varying degree of intellectual retardation. They also complained of earache, headache, vertigo, and display such nervous traits as nail-biting, constant drumming of the feet and nightmares. S. M. COLEMAN.

Clinical Findings in Electric Shock Treatment.

In a series of 121 patients treated by electric shock it was found that the following features at the onset of illness are indicators of a good prognosis: "A symptom-complex of muteness, perplexity and confusion, the presence of the symptom of fear of an immediate personal threat

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or danger, as well as depression and suicidal intent, age group 51–60 years, or 11–20 years, a background of familial stability, a duration of illness of less than one year, still better if the duration is less than three months, a sudden onset of illness, an exogenic precipitating factor, a good school and work record, a satisfactory marital and sexual relationship, a friendly individual.

" Portending a poor prognosis are : a gradual onset, a duration of illness more than one year, previous shock therapy, gradual loss of interest, negativism, restlessness, ideas of reference, grandiose delusions and certain personality traits." S. M. COLEMAN.

Prognostic Criteria in Schizophrenia.

The following criteria are regarded as of bad prognostic significance : hereditary taint, introverted " queer " prepsychotic personality, leptosomic body build, gradual onset of illness, a persistence towards discordancy of behavior and psychotic symptomatology in a setting of clear consciousness. The writer does not find that disorganized home conditions during childhood have any bearing on the prognosis. It is noted that the work of Gildea and Man on serum lipoid determinations is still in the experimental stage. S. M. COLEMAN.

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*EEG of Different Cortical Regions of Normal and Anaesthetized Cats. *Clark, S. L., and Ward, J. W.* 99
*Action of Veratrine on Nerve-muscle Preparations. *Kuffler, S. W.* 113
*Projection of the Retina on Superior Colliculus of Cats. *Apter, J. T.* 123

Electric Excitability of Nerve-muscle Fibre Preparations.

Electric excitability of single nerve-muscle fibre and whole sartorius preparations was determined under various experimental conditions :

1. Confirming other investigators a characteristic muscle and nerve-fibre excitability curve was obtained.

2. Voltage-capacity curves taken with micro-electrodes and larger electrodes at the motor endplate and at other parts of the normal muscle fibre did not show a difference in electric excitability. Various methods of passing current through the endplate region are described.

3. Curarine in paralytic or stronger concentrations does not influence the electric excitability of muscle.

4. Calcium reduction in the saline solution which did not produce spontaneous activity, or subthreshold concentrations of acetylcholine, had no appreciable effect on the voltage-capacity curves.

5. Potassium application can set up impulses along the whole length of muscle fibres, including endplate-free regions. The relation of chemical and electrical stimulation is discussed.

(Author's abstr.)

Choreiform Movements in a Dog Suffering from Cortico-striatal Disease.

In a case of encephalitis in a dog the conspicuous symptoms were choreiform movements confined to the left hind leg and an involuntary nodding of the head.

In the terminal experiment rhythmic movement of the left hind leg could be elicited by the stimulation of the right motor cortex.

Histopathological findings revealed focal encephalitic lesions in the putamens of both sides and in the deeper cortical layers of the medial part of the posterior sigmoid gyrus of the right side (the leg representation area).

The genesis of the choreiform movement and its relation to the cerebral motor cortex and the putamen are discussed. (Author's abstr.)

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Electroencephalogram of Different Cortical Regions of Normal and Anaesthetized Cats.

1. Concentric implanted leads with the stigmatic portion in contact with the brain allow the recording of patterns in the EEG of cats that are more specific than other methods tried. Such specificity indicates the need for attention to the method of obtaining the EEG when its interpretation is significant to an experimental procedure.

2. The greatest amplitude and the most specific detail was obtained from the concentric leads to the input of the amplifier. This tracing differed little from the pairing of the stigmatic lead to an indifferent source.

3. With the method used specific patterns were observable, especially in stages of sleep, from the frontal and occipital regions and vertex. Tracings from the temporal region and the pyramids displayed less characteristic differences.

4. The approach of sleep in cats is signalled in the EEG by the appearance of trains of 5–7 per second waves from the occipital leads. Deeper sleep is accompanied by spindles made of 12–14 per second waves from the frontal region, with random slow waves in all leads. These high amplitude trains and spindles do not usually show evidence of transmission to distant cortical regions.

5. Patterns obtained during nembutal sleep resembled those of normal sleep except that the stages were rapidly telescoped, and deeper stages appeared more readily.

6. Similar activation patterns may be produced by various stimuli in normal and in light nembutal sleep, but operative procedures carried out under deep nembutal anaesthesia do not result in visible changes in the EEG.

7. Temporary habituation to a standard stimulus in the normal resting animal may be demonstrated in the EEG by successively greater shortening and final obliteration of the period of activation when the stimulus is repeated a sufficient number of times at short intervals. The activation response immediately reappears when a new type of stimulus is applied.

(Authors' abstr.)

Action of Veratrine on Nerve-muscle Preparations.

The effect of veratrine has been studied in isolated sartorius muscles and single vener-muscle fibre preparations of the M. adductor longus in frogs (*Hyla aurea*).

1. The typical veratrine action consists in increasing the negative after-potential following a muscle spike. The negative after-potential is gradually built up, and resembles the potential changes produced by depolarizing drugs or by catelectrotonic current pulses. If the potential attains a critical height muscle impulses are initiated.

2. The negative after-potential momentarily " collapses " in that area of a muscle over which a 1 impulse passes.

3. Veratrine in concentrations of 10^{-5} to 10^{-7} does not change appreciably the resting potential of uninjured muscles, and does not alter the muscle spike or the time constant of the muscle membrane.

4. Veratrine does not affect the transmitter action in normal or curarized muscle, and shows no significant effect on the acetylcholine and potassium sensitivity.

5. It is suggested that the negative afterpotential is produced prior to, and is independent of, contraction. (Author's abstr.)

Projection of the Retina on Superior Colliculus of Cats.

1. A study of action potentials evoked on the surface of the superior colliculus of the cat was made by stimulating spots of known position on the retina with short flashes of light.

2. There is a systematic projection of the nasal field or temporal retina of the left eye on the left superior colliculus ; of the temporal field or nasal retina of the right eye on the right superior colliculus.

3. The nasal half of the area centralis of the left eye is projected only on the right superior colliculus ; the temporal half of the left area centralis is projected only on the left superior colliculus.

4. The upper field or lower retina is projected on the superior colliculus medial to the lower field or upper retina. Points along the vertical meridian are projected at the anterior end of the superior colliculus. Points 110° temporal to the vertical meridian of the visual field of the left eye are at the posterior end of the right superior colliculus. Points 90° nasal to this vertical meridian are at the posterior end of the left superior colliculus.

5. A comparison with findings by degeneration methods in the superior colliculus of the rat, the rabbit, and the opossum is made. (Author's abstr.)

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The Nature of Synaptic Transmission in a Sympathetic Ganglion.

Eccles investigated synaptic potential in the normal and curarized stellate ganglion of the cat with single and repetitive stimulation (particularly the effect of eserine) to throw light on the role of acetylcholine. Eserine changes synaptic potentials only by the addition of a prolonged potential build-up during stimulation and long outlasting the decaying phase of the normal potential. The fact that eserine does not modify the normal peak and tail is evidence against the acetylcholine hypothesis of synaptic transmission. The author's explanation is that a preganglionic impulse exerts a brief depolarizing action on the ganglion cell (peak) by the direct effect of its action current, while the tail effect is due to liberated acetylcholine, which is removed by cholinesterase. The eserine prolongation is caused by acetylcholine liberated by preganglionic stimulation, but not removed by cholinesterase.

M. E. Morse (Psychol. Abstr.).

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Organic Deterioration.

1. The question of organic deterioration arising where there is a diffuse loss of functioning brain cells is a problem frequently presented to the clinical psychologist, and the question has been raised as to whether the traditional battery of procedures might not be developed into a more critical series of carefully standardized tests for organicity.

2. The Worcester-Wells Memory Test, providing a variety of procedures for memory testing, has been described, and has been shown to be unique among memory tests in that it is standardized for adult age-groups. This is enormously important, since memory testing should allow for the fact that there is a normal loss of memory with age.

3. Organic deterioration, usually known as the organic mental syndrome, has been shown experimentally to involve a number of functions. Of these, memory, which is always involved, is also the function most amenable to exact testing.

4. In the elderly diagnostic groups it has been found that on the average, memory, although impaired, is not greatly below the normal expected for corresponding ages (Shakow). In fact, a large number of elderly psychotics are found to have normal memories. This indicates that in the advanced age-groups, as in all age-groups, emotional and personality difficulties are paramount in deciding whether an individual can live outside an institution.

5. In applying the Worcester-Wells Memory Test, a subnormal score may be the result of low intelligence, of schizophrenic or allied preoccupations of various kinds, of melancholic retardation, of dreamy and clouded states and, in short, of a variety of widely diverse psychiatric conditions, all of which interfere with maximal and sustained attention.

6. Therefore, caution should be exercised with this test as with all so-called "deterioration" tests in interpreting subnormal results, as a low score may result from global configurations of a nature quite different from organic deterioration.

7. However, assuming proper test conditions with sustained and maximal attention, normal or better than normal scores can definitely be interpreted as ruling out deterioration, whereas subnormal scores provide a rough quantitative index of the degree of impairment.

(Authors' abstr.)

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Electric Shock Treatment.

The therapeutic benefits of electric shock treatment as well as all forms of "shock" treatment are indeed a moot point. The factors that enter into the proper evaluation of the results are legion, and are so indefinite and nebulous that only general estimations are valid. In an effort to adopt one definite indication of improvement or cure, the fact of parole or convalescent status has been used as a criterion. In State hospitals this is admittedly a factor highly dependent on numerous varying circumstances, but must be used because nothing better is available. Patients leave State hospitals for various and sundry reasons. Even assuming that the ward physicians are ever alert to the advisability of convalescent care, many eligible patients are not brought to the attention of the clinical directors. Perhaps they have no places to go, no interested friends or relatives, and family care placement is not available or advisable. Perhaps they have physical problems that are better cared for in the institution. At the present time, relatives are less able to supervise convalescents because of almost universal employment or other occupation. Disinterested families are rather a common situation, and they produce a marked effect on convalescent care rates in general.

The attitude of the clinical director toward convalescence also reflects in the convalescent rate to a considerable extent. One clinical director might be quite sanguine about the adjustability of a certain patient, whereas another might not share his enthusiasm in the least. The entire subject is open to individual interpretation, and has significant bearing on convalescent status rates. Elopements, transfers, deaths, readmissions, discharges, poor adjustments on convalescent care, spontaneous recovery estimations are a few of the many operative factors. Probably no valid conclusions can be drawn in any case without the lapse of a considerable time interval. Previous treatment, either with insulin or metrazol, may be significant, although to what extent is problematical. The duration of the psychosis, presumed genetic factors if any, type and severity of psychosis, physical concomitants, reattainment of prepsychotic levels plus increments of normal growth and many other factors complicate the picture considerably.

The type of certification has a definite bearing on hospital releases. Voluntary patients are obviously more likely to exercise their prerogatives than those regularly certified are to leave. The latter are more dependent on the attitude of the clinical director and the medical staff.

In addition to this, the almost total lack of suitable controls is certainly operative. To select exactly parallel cases for non-treatment controls is obviously impossible, and to deprive any suitable case of the possible benefits of shock treatment seems inadvisable. In an effort to make a comparison of some sort, the author recorded total time spent in the hospital by members of a control group, and compared this with the hospitalization period of treated cases. This comparison is given in months in the table. These control cases were taken as received, beginning in September of 1931 and ending in December of 1936. None of these patients received shock treatments of any sort. They were classified according to diagnosis; and equal numbers of controls and treated patients were selected. Average time spent in the hospital was then figured for each diagnostic category. This included the time prior to death in some cases and the total time to the present for those remaining in the institution. The resultant differences are obviously marked; but, again, many factors enter into the picture, and the figures can only be regarded as approximate.

Psychotherapy in conjunction with "shock" treatment also has considerable influence on improvement and recovery. Nevertheless, in spite of the vast sum of unknown factors in connection with the treatment, electric shock seems to be of some benefit to the mentally ill.

(Author's abstr.)

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Case Lanuti: Extreme Concretization of Behavior Due to Damage of the Brain Cortex.

F. Lanuti (pseudonym), following severe brain injury, is the subject of this 9-year psychodynamic study, which catalogues data from experimental and clinical approaches and provides a descriptive-theoretical report of the effects of brain pathology, *via* de-differentiation processes, upon the personality structure. The report yields information on Lanuti's "perception and recognition of objects, his use of symbols, memory, emotion, and imagination, as well as on his general adjustment to his defect," including reactions to success and failure both in the laboratory tests and about the hospital. In all these spheres Lanuti is "limited to momentary action . . . is incapable of forming and maintaining stable frames of reference." Hence, "he presents in an extreme degree the picture of concreteness of behavior which Goldstein considers characteristic of organic deterioration." Little, if any, improvement in performance is apparent during the 9-year period. L. A. PENNINGTON (Psychol. Abst.).

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Physiological Differentiation of Emotional States.

The authors believe that there are at least three different physiological states corresponding to three different emotions: *fear*, with predominantly sympathetic excitation; *anger*, with strong parasympathetic excitation; and *excitement* or elation, with moderate parasympathetic activity. It would depend on the autonomic reactivity of the individual and the intensity of his emotional experience whether the reaction to the emotional effects will be noticeable during emotional stimulation or after it.

The authors also distinguish two excitatory states which they hesitate to call emotions (startle and explosive or epileptoid reactions), for both seem to represent a short circuit—what has been called a "functional decortication" (6)—*via* the cholinergic mechanism of the parasympathetic and central nervous systems. In both cases a "conscious" evaluation of the stimulus situation seems to be missing.

The authors suggest further that the most favorable conditions for activity are found in a moderate stimulation of the cholinergic mechanism, resulting in facilitation of action by "excitement" without untoward secondary adrenalin effects (at least for the duration of the activity). Neither anger nor fear can be shown to have an emergency function. Rather they represent obstacles to efficient action, the former by short-circuiting too large an amount of excitation into the parasympathetic system the latter by inundating the sympathetic system.

Amending Cannon's theory of homeostasis the authors would suggest, therefore, that during overactivity of the sympathetic division of the autonomic nervous system (in fear or cold) the balance of the organism is restored by a cholinergic *reaction* in the form of activity; and during parasympathetic overactivity (in anger or during heat) by a secondary sympathetic *reaction* with its adrenergic effects. If such a reaction is delayed or insufficient, or if the original stimulus is protracted too long, the primary effects of overstimulation may become irreversible.

(Author's abstr.)

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The Carbohydrate Tolerance of Mentally Disturbed Soldiers.

The Exton-Rose glucose tolerance test was performed on 20 normal soldiers and 91 military patients discharged because of psychiatric disorders. The patients showed a higher incidence of abnormal sugar tolerances (70 per cent.) than the normal subjects (30 per cent.). Excessive secretion of adrenalin did not seem to be a major factor in the causation of such trends. A relationship between high blood-sugar level and psychological condition is suggested by certain Rorschach findings, and by the alteration of the blood-sugar level of subjects with normal trends by the introduction of a state of psychological stress. (Authors' abstr.)

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The Difference in the Mental Reaction between Children Suffering from Cerebral and Cerebellar Tumors. *Davidoff, L. M.* 38
The Relationship of Anti-social Traits to the EEG in Children with Behavior Disorders. *Michaels, J. J.* 41

Brain Waves and Clinical Features in Arteriosclerotic and Senile Mental Patients.

1. Fifty-three arteriosclerotic and senile patients were studied from both the EEG and the clinical points of view. The EEGs were classified according to previously defined criteria. The following clinical symptoms proved to be particularly important in relation to this study: confusion, irritability, agitation, anxiety, delusions, depression, and hallucinations. Memory disorders had to be disregarded, being obscured by confusion. However, they have been taken into consideration in making the diagnosis of these patients.

2. About a third of these patients show a markedly abnormal pattern (slow), whereas another third do not present any definite abnormality.

3. In the group of patients with marked slow abnormality, the clinical complex confusion—irritability overshadows the complex anxiety—agitation—delusions. The opposite finding is observed in the group of patients with normal or only borderline tracings.

4. The doctrinal significance of the existence of definite organic lesions which do not produce a marked EEG abnormality when associated with anxiety, agitation, and delusion, is stressed. The relationship of this group of patients with those suffering from involutional psychosis is suggested. (Authors' abstr.)

Brain Waves and Heredity in Mental Diseases.

Electroencephalographic examinations were performed on 118 patients aged between 13 and 23 years, suffering from all types of mental disease. Thirteen of these patients had a personal history of a neurological disorder. These patients were classified in different groups according to the presence and importance of the abnormal hereditary factors.

There are relatively more patients with normal EEG's in the population with a negative family history than in the population with mental conditions in the family.

Both the theoretical and practical significance of these findings is stressed.

(Authors' abstr.)

MARCH.

Objective Personality Studies in Migraine by Means of the Rorschach Method. *Ross, W. D., and McNaughton, F. L.* 73
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*An Experimental Study of the Functions of the Frontal Lobes in Man. *Yacorzynski, G. K., and Davis, L.* 97

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An Experimental Study of the Functions of the Frontal Lobes in Man.

The results on a number of experiments of five patients with unilateral lesions of the frontal lobes (one with a lesion of the left lobe and four with lesions of the right lobes) were compared with those of eight normal controls of approximately the same age range and educational status.

On five experiments the following differences were found between the two groups: (1) The subjects with frontal lobe lesions required a longer time and more illumination to perceive geometrical figures and words than the controls. (2) They were unable to perceive as many meaningful objects in ambiguous figures as the controls. (3) The illusory effect of the Muller-Lyer illusion measured quantitatively was exaggerated, and the illusory effects of many other visual illusions were not perceived. (4) The patients were unable to recall as many objects exposed visually as the controls. (5) They were unable to perceive reversals on many of the figures with reversible perspectives, and if reversals occurred their frequency was below average.

The differences between the patients and the controls can be accounted for by postulating that following frontal lobectomies, (1) a longer time is required to perceive a stimulus, (2) the number of situations which are perceived in a stimulus field is decreased, (3) there is an inability to shift readily from one stimulus to another, and (4) there is a distortion of normal perceptions. The results on the visual illusions suggest that when a normal reaction is affected by frontal lobectomy, a response which appeared earlier in the behavior of the individual replaces the mature adult response.

Other forms of atypical behavior were noted as follows: Euphoria was present in two of the experimental subjects. The patient with a lesion of the left frontal lobe showed unmistakable symptoms of aphasia. Many of the reactions of the four patients with lesions of the right lobes were, however, similar to the symptoms which have been described as constituting part of the syndrome of aphasia. It is suggested that symptoms which have often been ascribed as belonging to the fields of emotion and aphasia are due largely to the disturbed perceptual processes.

Immediate memory, as far as could be determined, was not affected in the subjects with frontal lobe lesions. It is, therefore, suggested that association, if uncomplicated by perceptual processes, is not primarily a function of the frontal lobes.

One of the subjects with a lesion of the right lobe showed some restitution of behavior with the lapse of time. There is some evidence to show that a recovery of the function which was affected did not occur, but that substitute behavior produced the same end-results as would have been produced by the affected function. (Authors' abstr.)

MAY.

The Incidence of Psychosomatic Affections in Britain. *Halliday, J. L.* 135
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*Psychophysiological Relations in Cases with Head Injuries. *Ruesch, J.* 158

Psychophysiological Relations in Cases with Head Injuries.

1. Respiratory functions under basal conditions and during work, muscular tension and heart rate during endurance to pain and fatigue have been correlated with tests of intelligence and personality in five groups of patients. These consisted of 16 cases with brain disease, 29 cases with recent head injuries, 29 cases of post-traumatic syndromes and signs of brain damage, 28 cases of post-traumatic syndromes without signs of brain damage, and 30 cases with psychoneuroses. In addition, 15 normal controls were subjected to some of these tests.

2. The post-traumatic syndromes without signs of brain damage resembled the psychoneuroses more than the post-traumatic cases with evidence of brain lesions. The cases with recent head injuries were in many respects the most normal of all the patients studied.

3. Basal ventilation volume and tidal air increased proportionately with rising neurotic scores in the Minnesota Multiphasic Personality Inventory. The higher the basal ventilation volume, the smaller was the subsequent increase during work. Irregularity of breathing was measured by a new scoring method, which revealed that individuals with neurotic tendencies breathe irregularly, especially during work.

4. Metabolism under basal conditions and during work was higher in cases with signs of brain damage than in cases without evidence of a lesion. The more intelligent subjects were apt to use less oxygen than patients with average or sub-average intelligence.

5. During examination of endurance to strain (work of the hand during complete ischemia), all the cases with head injuries showed a smaller rise in heart rate than either cases with brain disease, psychoneuroses, or normal controls. Return of the heart rate to the initial level following exercise was delayed in the acute head injuries. Muscular tension was greatest in cases with brain disease and smallest in the normal controls. Endurance to strain was smallest in the psychoneuroses.

6. In conclusion it can be said that there exists an antagonism between presence of brain damage and psychoneuroses. The more marked one component, the less obvious the other becomes. Cases with post-traumatic syndromes usually show presence of both components, but with marked prevalence of the neurotic aspects. (Author's abstr.)

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QUART. J. STUD. ALCOHOL.

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The Treatment of Alcohol Addiction in Relation to the Prevention of Inebriety. *Myerson, A.* 189
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Alcoholic Deaths in the Canal Zone, 1904–44. *Hoekenga, M. T., and Kean, B. H.* . . 15
The Relation of the Pituitary Gland to Some Symptoms of Alcoholic Intoxication and Chronic Alcoholism. *Gross, M.* 25
Ecological and Familial Factors Associated with Inebriety. *Mowrer, H. R., and E. R.* . 36

Some Biochemical and Electroencephalographic Changes in Delirium Tremens.

Studies were made on sodium and chloride excretion and on electroencephalograms of 71 patients with delirium tremens. Significant changes were found in both instances.

1. The excretion of sodium and chloride of these individuals was abnormal in 11 of 19 cases, the Na/Cl ratio, which is 1 : 1 in normal individuals, being disturbed in the alcoholics. In 7 cases the indication was that there had been chloride loss preceding the onset of delirium tremens.

2. The electroencephalograms showed a relatively high incidence of fast 16–30/sec. low-voltage activity as compared with the normal. The percentage decreased with the recovery of the patient.

3. The patients who showed most fast activity and lowest amplitude at the onset of the disorder were those who recovered slowest and who, from their history, were the least stable socially in the intervals between their alcoholic episodes.

4. Psychological tests on 12 patients with delirium tremens revealed a common pattern of emotional and social instability in all. Organic deterioration was present in patients whose electroencephalograms demonstrated greatest deviation from the normal.

5. Records of 12 alcoholics, either in the acute stage of alcoholic intoxication, markedly deteriorated, or with polyneuropathy, but without delirium tremens, did not show the increased fast activity and low alpha index seen in the patients who had delirium tremens.

(Authors' abstr.)

REV. MEX. NEUROL. PSIQUIAT.

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RORSCHACH RES. EXCH.

VOL. IX. MARCH, 1945.

Physiognomic Phenomena in Rorschach Responses. *Goldstein, K., and Rothman, E.* . 1
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Defective Moral Reasoning in Delinquency. *Belke, M. A.* . . . . . No. 4

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The Logical Foundations of Culture and Personality Studies. *Devereux, G.* . . . 110

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VOL. X. 1943.

Pathology of Instinct. *Brantway, H.* . . . . . No. 4
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1. Psychiatry.

Impairment in Emotional Control Produced Both by Lowering and Raising the Oxygen Pressure in the Atmosphere: a Fundamental Relation Between Psychic and Somatic Processes. Barach, A. L. [*Med. Clin. N. Amer.*, **28**, 704–18 (1944).]

This study is based on simulated altitude tests and on observations of patients with chronic anoxemia. Capacity to inhibit impulse (emotion) depends on maintenance of an accustomed oxygen tension in the brain, and decreased control is the outstanding sign of alteration and is the best tolerance test. In acute anoxia it is evidenced, according to the personality and environment, by boisterousness, overconfidence and pugnacity, or by irritability and dullness. If a special effort is made, performance of intellectual tests may be normal until a challenging incident brings out the latent emotional control, at which time performance declines sharply. Psychoneurotics are especially sensitive to acute anoxemia. In patients with chronic anoxemia, an abrupt rise in oxygen pressure may cause profound temporary impairment of emotional control, judgment, and memory. The relation between psychic and somatic processes, with respect to the effects of variable oxygen tension in the organism, offers a fruitful field for psychosomatic medicine and the study of the ageing process. M. E. MORSE (Psychol. Abstr.).

Cerebral Circulation—Intrinsic Control and Clinical Phenomena. Cobb, S., and Lennox, W. G. [*Fed. Proc. Amer. Soc. exp. Biol.*, **3**, 151–8 (1944).]

The authors discuss cerebral circulation and its relation to the electroencephalograph, syncope, epilepsy, migraine, and trauma. They also discuss vasoconstriction, vasodilatation, and local blood flow due to nervous function. C. G. MUELLER (Psychol. Abstr.).

Catelectrotonic Potentials in the Dorsal Roots of the Spinal Cord. Eccles, J. C. [*Nature, Lond.*, **154**, 395 (1944).]

Experiments on the isolated oxygenated spinal cord of the frog suggest that the dorsal root potential is a catelectrotonic potential set up in the central terminals of the dorsal root fibers by the actively depolarizing action of potential produced in nerve cells in close proximity, particularly in synaptic contact. This would explain the extensive distribution up and down the cord of the dorsal root potential produced by a volley in one dorsal root.

E. B. BRODY (Psychol. Abstr.).

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Electroencephalographic Response to Overventilation and Its Relation to Age. Gibbs, F. A., Gibbs, E. L., and Lennox, W. G. [*J. Pediat.*, **23**, 497–505 (1943).]

The EEGs of 2,281 non-epileptic and 1,107 epileptic subjects were studied with reference to the increase in amplitude and decrease in frequency (build-up) occurring with 100 deep breaths. A big (maximum) build-up is most common in persons whose EEGs are abnormal. In both normal and epileptic subjects the incidence of big build-ups falls abruptly with increasing age until the 35th year, after which the decline is negligible. The incidence is greater at all ages in epileptics than in normals, but this difference is greatest during adolescence. The decreasing frequency with increasing age agrees with observations that other abnormalities of the EEG as well as the seizures themselves tend to improve as the person reaches maturity.

M. E. Morse (Psychol. Abstr.).

Characteristics of the Normal Electroencephalogram. (I) A Study of the Occipital Cortical Potentials in 500 Normal Adults. Brazier, M. A. B., and Finesinger, J. E. [*J. clin. Invest.*, **23**, 303–11 (1944).]

The subjects, 17–47 years old, were studied under controlled conditions of blood sugar and quiet breathing with respect to dominant frequency; percentage times of alpha, intermediate, beta, and slow activities; and voltage. The following characteristics were found: An individual's dominant frequency is comparatively stable over long periods (two years), but becomes less so with increasing age. There is an inverse relation between percentage time alpha and the dominant frequency of that alpha. Intermediate waves are rarely found in any quantity. The percentage time beta remains nearly constant for the individual. Waves below 8 occurred in 25 per cent. of the subjects. No delta waves were found. Maximum voltages were higher in records containing the most alpha, with dominant frequencies in lower alpha. None of these characteristics correlated with sex, height, or weight. Differentiation into alpha, beta, and delta rhythms is arbitrary. It is more accurate to describe rhythms in terms of actually measured frequencies until some physiological or statistical reason is found for grouping frequencies into rhythms.

M. E. Morse (Psychol. Abstr.).

Characteristics of the Normal Electroencephalogram. (II) The Effect of Varying Blood-Sugar Levels on the Occipital Cortical Potentials in Adults During Quiet Breathing. Brazier, M. A. B., Finesinger, J. E., and Schwab, R. S. [*J. clin. Invest.*, **23**, 313–17 (1944).]

Studies of 45 normal subjects showed that levels below 70 mgm., but insufficiently low to impair consciousness, slow the dominant frequency and favor the development of activity slower than alpha. No changes occurred in percentage times of alpha, beta, and intermediate rhythms. Levels above 130 mgm., induced by ingestion of glucose, do not affect the EEG. In assessment of the EEG for normality, the subject should take 50–100 gm. glucose 30 minutes before the test in order to assure a blood-sugar level above 70 mgm.

M. E. Morse (Psychol. Abstr.).

Characteristics of the Normal Electroencephalogram. (III) The Effect of Varying Blood-Sugar Levels on the Occipital Cortical Potentials in Adults during Hyperventilation. Brazier, M. A. B., Finesinger, J. E., and Schwab, R. S. [*J. clin. Invest.*, **23**, 319–23 (1944).]

Forty-five normal subjects, 17–38 years old, were studied. Great variation was found as to the blood-sugar level at which delta waves appeared during hyperventilation. In 13 per cent. they did not occur even with blood sugar at 40, whereas in 4 per cent. they occurred at all levels. Delta activity in the third minute of hyperventilation is not diagnostic of abnormality, since it occurs in 38 per cent. of normals at non-fasting blood-sugar levels. The second minute gives better differentiation, as only 7 per cent. of normals give delta activity at non-fasting levels, and none above 130 mgm. The percentage time delta varies inversely with the blood-sugar level. The tendency to produce delta activity on hyperventilation is not related to the dominant frequency of the individual's resting record. At constant blood-sugar levels the depth of hyperventilation is the decisive factor in determining the amount of delta activity. Apparently, at lower adult age levels the EEG is less stable to changes in blood-sugar and ventilation levels.

M. E. Morse (Psychol. Abstr.).

Variations in the Electroencephalogram During the Menstrual Cycle. Dusser de Barenne, D., and Gibbs, F. A. [*Amer. J. Obstet. Gynec.*, **44**, 687–90 (1942).]

Successive-day comparisons of the electrical activity of the cortex in 11 healthy young women revealed no simple rigid relation between the EEG and the menstrual cycle; but in the majority, electrical activity became slower after the beginning of the menstrual flow, and in some a disturbance of frequency regulation occurred at the midmenstrual period.

M. E. Morse (Psychol. Abstr.).

An Experimental Study of Monopolar and Bipolar Derivations in the Human Electroencephalogram. Cohn, R. [*Proc. Soc. exp. Biol., N.Y.*, **55**, 240–2 (1944).]

Experiments carried out on cadavers have demonstrated that the important characteristic amplitude properties of the alpha component of the normal human EEG, in the usual monopolar derivations, primarily depend on the attenuating properties of the tissue through which the potential difference is transmitted. Moreover, the correspondence between wave forms seen in

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the normal EEG and those produced by an artificial occipital electric dipole in the cadaver indicates that the spread of an occipital electric disturbance is an excellent model for the production of the amplitude characteristics of the basic alpha component of the normal EEG.

H. PEAK (Psychol. Abstr.).

The Electroencephalogram in Pregnancy. Gibbs, F. A., and Reid, D. E. [*Amer. J. Obstet. Gynec.*, **44**, 672–5 (1942).]

The EEGs of 28 women, 8 of whom had toxemias, indicate that the electrical activity of the cortex is slowed in pregnancy and that, as a group, patients with toxemias show more high-voltage fast activity and less normal activity than patients without toxemia. Most of the records were taken in the last two weeks of pregnancy. In the cases in which both pre- and post-partum records were obtained, cortical activity was usually slower during pregnancy.

M. E. MORSE (Psychol. Abstr.).

Effects of Morphine on Cortical Electrical Activity of the Rat. Cahen, R. L., and Wikler, A. [*Yale J. Biol. Med.*, **16**, 239–43 (1944).]

"1. Small sedative doses of morphine (less than 20 mg. per kg.) have little or no effect on the cortical electrical activity of the unanesthetized rat. After injection of relatively large doses of morphine (20 to 50 mg. per kg.) increase in amplitude and decrease in frequency appear early. Somewhat later, periodic 'bursts' of 10 to 12 per second waves of high amplitude appear and persist for several hours. 2. These effects are similar to those produced by moderate doses of barbiturates in man and in animals, and the EEG pattern resembles that seen during natural sleep in man. 3. Large doses of morphine (200 mg. per kg.) or smaller doses (40 to 100 mg. per kg.) combined with moderate doses of a barbiturate (9 to 30 mg. ker kg.) decrease the amplitude and finally abolish the cortical electrical activity because of marked respiratory depression with resulting anoxia. If anoxia is prevented by artificial respiration, cortical electrical activity returns. 4. The changes produced by morphine in the electrical activity of the cortex of the rat are not specific for this drug, and appear to be produced by mechanisms similar to those operating during light or moderate barbiturate narcosis." A. WEIDER (Psychol. Abstr.).

Physiological Aspects of Convalescence and Rehabilitation Following Central Nervous System Injuries. Goldstein, K. [*Fed. Proc. Amer. Soc. exp. Biol.*, **3**, 255–65 (1944).]

The questions to be kept in the foreground in considering problems of rehabilitation are whether, and in what degree, the disturbance of performance can be reversed; what can be done to promote spontaneous restoration; and, if a full restitution is not to be expected, how should one proceed with retraining. The author considers the origin and classification of symptoms in brain damage and then discusses the procedure of rehabilitation in relation to the various forms of symptoms, including under this discussion the rehabilitation in impairment of general performance capacity, special performance capacity, and capacity for abstractions.

C. G. MUELLER (Psychol. Abstr.).

Prefrontal Lobotomy in Schizophrenia. Freeman, W. J. [*Inst. of Living, No.* 12, 495–502 (1944).]

The author, using 170 psychopathological cases from five diagnostic groupings, describes and favorably evaluates one modification of the Moniz psychosurgical procedure. More than half of the schizophrenics are usefully occupied, with only one in seven institutionalized. The salient characteristic of post-operative patients is the marked loss in self-consciousness; seven abbreviated case-histories are illustrative. Brief reference is made to histological study of necropsic tissue with emphasis placed upon the disruption of thalamo-frontal-cortical tracts. This operative technique is recommended only as a last resort in therapeutic effort.

L. A. PENNINGTON (Psychol. Abstr.).

2. Biochemistry, Physiology, Anatomy, Pathology, etc.

Muscular Excitability in Experimental Polyneuritis. Chauchard, P., and Mazoué, H. [*Compt. rend. soc. biol.*, **137**, 19–20 (1943).]

In rats deprived of vitamin B_1 muscle chronaxia remained normal for a time, then later increased when muscle degeneration began. L. E. GILSON (Chem. Abstr.).

Chlorination of Human, Monkey-adapted, and Mouse Strains of Poliomyelitis Virus. Trask, James D., Melnick, Joseph L., Wenner, Herbert A., and Joiner, Robert. [*Am. J. Hyg.*, **41**, 30–40 (1945).]

This study is concerned with the effect of Cl on poliomyelitis virus as present in stools of paralytic patients, and in suspensions of monkey spinal cords after 5 to 16 successive transfers after the original isolations from human stools, and with the effect of NaOCl, chloramine and azochloramide (N, N-dichloroazodicarboxamidine) on the FA strain of Theiler's mouse poliomyelitis virus. *Macaca mulatta* were the experimental animals in all cases but one, where *Cercopithecus aethiops sabeus*, the green African monkey, was used. Inoculations were made intracerebrally or by peripheral routes. A residual Cl level of 0·4 and 0·5 p.p.m. after 10-minute contact was insufficient to inactivate a 10^{-2} CR- and 10^{-3} SK-strain concentration of

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cord respectively. The WA strain of virus present in a 10 per cent. centrifuged suspension of stools withstood a 120-p.p.m. Cl dose, leaving a residual value of 15 p.p.m. after a 10-minute contact. For the FA (mouse) strain a residual Cl (chloramine) level of 0·57 p.p.m. after 30-minute exposure was needed to reduce the infectivity of a 10^{-5} infected brain concentration to one ID_{50} (= the amount of virus which produces the disease after intracerebral inoculation in 50 per cent. of the mice inoculated). For each 10- or 100-fold increase in virus concentration a proportional increase in Cl concentration was required. Similarly, 0·35- and 12·1-p.p.m. Cl levels were needed for NaOCl and azochloramide respectively to reduce 10^{-5} brain concentrations to one ID_{50}. In the case of NaOCl, for each 10-fold increase in virus concentration a 5-fold increase in residual Cl was needed. When extraneous organic matter was added to a 10^{-5} concentration of infected brain, the Cl residual values, after sufficient additional Cl had been added to meet the additional demand, had to be increased as much as 10 to 18 times to inactivate the same amount of virus as in the original suspension. This last observation must be taken into consideration when applying laboratory results to the *chlorination of natural wastes*.

BRUNO VASSEL (Chem. Abstr.).

The Involuntary Nervous System during Hypothermia in the Rabbit. Vallery-Radot, Pasteur, Mauric, G., Holtzer, Mme. A., Domart, A., and Lemant, J. [*Compt. rend. soc. biol.*, **137**, 78–9 (1943); *cf. C.A.*, **37**, 3161⁷.]

Hypothermia decreased the pressor activity of adrenaline, but did not modify the action of acetylcholine.

L. E. GILSON (Chem. Abstr.).

Lactic Acid Oxidation Quotient in Minced Brain of Normal and Avitaminotic Chicken. Galvão, P. E., Pereira, J., and Limongi, J. Papaterra. [*J. Biol. Chem.*, **157**, 667–71 (1945).]

Determinations were made of O_2 uptake with and without added lactate, lactate decline, and oxidation quotient of lactic acid in finely minced cerebrum and brain stem of normal and B_1-avitaminotic chickens. In the avitaminotic brain stem there was an average decrease from the normal of about 74 per cent. in the increased O_2 uptake with added lactate, while the lactate loss decreased on the average about 37 per cent.; consequently the oxidation quotient tended to rise. In one instance the added lactate inhibited the residual respiration. Added vitamin B_1 aided both the increased O_2 uptake and the lactate decline; this observation differs from those previously reported (*cf. C.A.*, **35**, 7010⁵) on ground tissue. No differences were found between normal and B_1-avitaminotic cerebrum.

J. M. LITTLE (Chem. Abstr.).

Convulsions Experimentally Produced in Dogs. Keith, H. M., Essex, H. E., and Schlotthauer, C. F. [*Amer. J. Dis. Child.*, **68**, 265–8 (1944).]

The purpose of this experiment was to discover a satisfactory method for producing in animals a series of spontaneous convulsive seizures such as occur in patients suffering from epilepsy. The main method of attack was that of freezing certain areas of the cerebral cortex. Convulsions were produced by this method in 82 per cent. of the animals who were operated on twice (freezing agent applied to both left and right hemispheres) and in 52 per cent. of those operated on only once (left hemisphere). The results obtained when other substances were applied to the brain are also given.

L. LONG (Psychol. Abstr.).

The Functional Organization of the Cerebral Cortex. McCulloch, E. S. [*Physiol. Rev.*, **24**, 390–407 (1944).]

Functional organization depends both on the physico-chemical reactions of constituents and on their anatomical relations. Since the reactions of all neurons are similar, it is often possible to deduce anatomy from activity and to predict activity from anatomy. The subject is reviewed under the following headings: General organization from the developmental standpoint; common functional properties of the cortex; cortical sectors as defined by thalamocortical connections, and regions as distinguished by differing density of these projections; description of these sectors and regions; and intracortical, inter-regional and interhemispherical connections. The primary sensory areas do not give rise to inter-regional associational fibers. This emphasizes the importance of associational areas. Certain tenets of the psychology of perception can be deduced from the physiology of the primary sensory areas. It is to be expected that ultimately knowledge of associational areas and inter-regional connections will lead to a physiological interpretation of the more complex psychological problems.

M. E. MORSE (Psychol. Abstr.).

Studies on the Effect of Anoxic Anoxia on the Central Nervous System. Kessler, M., Hailman, H., and Gellhorn, E. [*Am. J. Psychol.*, **140**, 291 (1943).]

"Studies on the effect of lowered barometric pressure on unanesthetized rats have shown that when the ascent is carried out rapidly a period of temporary silence of the cortex occurs at a level of 190 mm. Hg from which the animals recover spontaneously in spite of continued lowered barometric pressure. . . . Rats injected with benzedrine show similar changes in EEG as far as the period of cortical silence is concerned, but they show during the subsequent recovery a normal EEG without spindles and without any further signs of depression of activity. . . . If the pressure is lowered to 110 to 140 mm. Hg, a period of electrical silence occurs from which no recovery at that barometric pressure is possible. As the gasping and slowing of pulse show, the

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medulla is involved in these conditions. Benzedrine, which increases the resistance of rats to anoxia as indicated by the EEG at moderate degrees of anoxia, does not increase the resistance or the survival time of rats under conditions of extreme anoxia. Conversely, rats fed with carrots, although showing an increased survival time under lethal conditions, do not show any improvement in performance or in EEG under conditions of more moderate anoxia."

T. G. ANDREWS (Psychol. Abstr.).

Action of K and Narcotics on Rectification in Nerve and Muscle. Guttman, Rita. [*J. Gen. Physiol.*, **28**, 43–51 (1944).]

Electrical rectification, or the ability to let the electric current pass more easily outward than inward, is probably a property of the plasma membrane. The rectification studied on the frog sciatic nerve and sartorius muscle has been shown to be reversibly decreased by increasing K+ concentration, $CHCl_3$, veratrine sulfate or isoamyl carbonate. Neither $CaCl_2$ nor $BaCl_2$ had any effect.

S. MORGULIS (Chem. Abstr.).

Influence of Acute Intracranial Pressure on the Circulation and Blood Sugar. Osterchrist, Walter. [*Deut. Z. Chir.*, **258**, 222–35 (1943).]

Development of intracranial pressures is a means of explaining acute clinical syndromes. In selected patients heightened pressures, studied by lumbar encephalography, influence pulse, blood pressure and fasting blood sugar, pointing to stimulation of a medullary center. The diagnostic significance for evaluation of cranial injuries is proved by blood-glucose tolerance tests.

LUCIEN Y. DYRENFORTH (Chem. Abstr.).

Steroids as Structurating Agents on Social Behavior in Castrated Benzedrinized Mice. Chance, M. R. A. [*J. Physiol.*, **103**, 13P (1944).]

Normal mice of either sex treated with 20 mgm. of benzedrine per kgm. body weight show an activity slightly more marked than, but similar in behavior to, the untreated animal. On the other hand, such animals in groups show aggressive and defence attitudes alternating with escape reactions during excitation with the drug. Unlike normal animals, castrates show the same behavior in groups as when alone; there is rapid random alternation between activities of different types. Male castrates receiving DCA or other steroid hormones prior to the benzedrine behave similarly to normal animals receiving benzedrine; female castrates show only a slight tendency to return to the normal behavior of intact animals receiving benzedrine alone.

H. L. WILLIAMS (Chem. Abstr.).

Utilization of O by the Brain in Traumatic Shock. Blalock, Alfred. [*Arch. Surg.*, **49**, 167–9 (1944).]

The arteriovenous O difference in cerebral blood is considerably increased in the early stages of traumatic shock. It appears that the brain can maintain its O consumption, at least partially by extracting O from the arterial flow, under conditions of decreased blood flow.

JOHN T. MYERS (Chem. Abstr.).

Enzymic Oxidation of Mescaline in the Rabbit Liver. Blaschko, H. [*J. Physiol.*, **103**, 13–14P (1944).]

Differences between the oxidation of mescaline and of l-p-synephrine, a typical substrate of amine oxidase, make it unlikely that the enzyme amine oxidase takes part in the oxidation of mescaline. Sec-octyl alcohol, a strong inhibitor of amine oxidase, did not interfere with the oxidation of mescaline. Also methylene blue had only a very slight inhibitory effect on the oxidation of mescaline in concentrations in which the oxidation of synephrine was completely abolished. Adding mescaline to synephrine in saturation concentration caused an increased rate of O uptake.

H. L. WILLIAMS (Chem. Abstr.).

Oxygen in the Blood Emerging from the Brains of Post mature Fetal Rabbits. Barcroft, J., and Young, I. Maureen. [*J. Physiol.*, **102**, 25–6P (1943).]

Gestation was prolonged by the daily intravenous injection of 100 units of human pregnancy urine extract and subcutaneous injection of 9 mgm. of progesterone, and an estimation of the O atm. to which the fetus was exposed was made by sampling the blood from the venous sinuses by intracranial puncture. During the period of post-maturity the O content of the blood falls progressively, leading from a condition of mild anoxemia to one of profound anoxemia and death. The placental mechanism for the supply of O appears unable to keep up with fetal growth.

H. L. WILLIAMS (Chem. Abstr.).

The Higher Centers and the Blood-sugar Curve. Reid, C. [*J. Physiol.*, **102**, 20P (1943).]

The sniffing and tasting of meat by a female dog weighing 12·5 kgm. receiving 2·5 gm. glucose/kgm. (by stomach tube) or 1 gm./kgm. (intravenously) after a 24-hour fast was followed by a more rapid lowering of the blood-sugar curve than in the corresponding experiments without the exhibition of meat. In addition, sniffing and tasting meat without sugar administration caused a fall in blood sugar. These data suggest that the output of insulin is increased after activation of the higher centers through the olfactory and gustatory mechanisms.

H. L. WILLIAMS (Chem. Abstr.).

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Concentration of the Virus of Poliomyelitis by Differential Centrifugation. McKinstry, D. W., Terrill, H. M., Reading, E. H., and Huffman, K. V. [*J. Franklin Inst.*, **238**, 310–16 (1944.]

Experiments directed toward the preparation of pure, active virus for the determination of the chemical nature and physical properties of the parasite showed that the SK murine strain of the virus of poliomyelitis can be completely sedimented, without inactivation, from mouse brain tissue homogenized in 0·1 per cent. glycine, by a centrifugal force 61,000 times that of gravity. Preliminary centrifugal treatment at 1,500, 3,000, 12,000 and 20,000 r.p.m. for varying periods of time eliminated a large percentage of the normal protoplasmic constituents without loss of virus activity. The purest preparations contained a small but constant amount of tissue proteinaceous material. Electrophoretic analysis (curves not given) revealed the presence of three components in the final preparations. E. B. SANIGAR (Chem. Abstr.).

The Pattern of Distribution of Carbonic Anhydrase in the Cerebrum of Man Compared with that of Certain of the Lower Animals. Ashby, Winifred, and Chan, Dorothea V. [*J. Biol. Chem.*, **156**, 323–9 (1944); *cf. C.A.*, **39**, 95[1]; **38**, 2097[8].]

In hog, dog and cat brain a greater amount of carbonic anhydrase was found in the cortex than in the white matter immediately below it, an average ratio of 34·9/22·5 occurring in 20 series tested. In human brain the reverse was true in 81 series from 18 brains, except in the motor area, where the relationship was that found in animal brains.

H. L. WILLIAMS (Chem. Abstr.).

The Distribution of Carbonic Anhydrase in the Cerebrum. Ashby, Winifred, and Chan, Dorothea V. [*J. Biol. Chem.*, **156**, 331–41 (1944); *cf. CA.*, **39**, 95[1]; **38**, 2097[8].]

Analysis of human brains obtained at autopsy showed that the temporal pole contained the least amount of carbonic anhydrase (25 units/gm.); the frontal pole and lateral temporal areas had about equal activity, 30–35 units/gm.; the parietal area had a greater activity, 35–40 units; and the areas in the occipital lobe had the highest content, 40–50 units/gm., with area 17 having a slightly higher content than area 18. In the frontal pole the difference between the greatest and least amount of carbonic anhydrase found was 18 units/gm., while for the parietal and occipital areas the values were 14 and 13 units/gm., respectively. The average difference between the carbonic anhydrase content of the outer half of the cortex and that of the white matter immediately below the cortex in the frontal pole was 12·5 units/gm.; that for the occipital pole was only 4·8 units/gm. There seemed to be slightly more carbonic anhydrase in the left frontal pole than in the right, up to 4·8 units/gm. more (average 2·6 units/gm.). However, with the occipital lobe, the right and left differed by 9·9 units/gm. on the average, with either side being the higher. The differences between the carbonic anhydrase content of various parts of the right and left hemispheres of one brain progressing from the frontal to the occipital poles showed a rather smooth change, beginning with a slight preponderance in favor of the left frontal lobe and ending with a large difference in favor of the right occipital pole, though the actual enzyme levels in the brain showed considerable variation. In all the preponderance was in favor of the right side of the human brain. The high content of carbonic anhydrase of the occipital region of the human brain, 30 per cent. greater than in the frontal region, is suggested to be due to sight being man's dominant sense. In dogs, on the other hand, sight is not so dominant and the carbonic anhydrase of both regions is approximately the same, frontal 24·1 units/gm., temporal 19·7, parietal 21·2 and occipital 22·1. The carbonic anhydrase content of the rostral half of the guinea-pig brain was 25·6 units/gm. on the average, that of the caudal half, 33·8 units/gm., a 30 per cent. increase of the latter over the former. These data are discussed in relation to normal electroencephalograms. H. L. WILLIAMS (Chem. Abstr.).

The Artificial Phospholipide Membrane, Semipermeability and the Blood-brain Barrier. Weatherby, J. H. [*J. Lab. Clin. Med.*, **28**, 1817–20 (1943); *cf. C.A.*, **38**, 4492[1].]

The collodion membrane containing lecithin and cephalin is permeable to molecules but not to ions. The rate of permeation of such membranes is affected by changes in pH, esterification and salt formation which tend to change the degree of ionization. There is a striking parallelism between penetration or non-penetration of many substances into the brain from the blood stream, and the permeation or non-permeation of these same substances with respect to the artificial membrane. This fact suggests that cell membranes which contain phospholipides constitute the so-called blood-brain barrier. HOWARD W. ROBINSON (Chem. Abstr.).

Neurosecretion. Scharrer, Ernst, and Scharrer, Berta. [*Physiol. Rev.*, **25**, 171–81 (1945).]

In the central nervous sytem of both invertebrates and vertebrates groups of nerve cells are found which manifest cycles of secretory activity similar to those observed in gland cells. In fishes and amphibians the secretory granules appear in the nerve cells in association with chromatin, basophil cytoplasm or Nissl bodies, while in insects and fishes the neurosecretory products follow pathways along the axons to the endocrine glands. In invertebrates, in two instances, physiologically active substances were traced to neurosecretory cells in the central nervous system. S. MORGULIS (Chem. Abstr.).

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Glycolysis in the Parts of the Central Nervous System of Cats and Dogs during Growth. Chesler, Annette, and Himwich, Harold E. [*Am. J. Physiol.*, **142**, 544–9 (1944); *cf. C.A.*, **37**, 5466[5].]

In the newborn, glycolysis is most rapid in the medulla and is slower in both cephalad and caudad regions. In the adult, the highest rates are in the caudate nucleus and cerebral cortex, with lower rates in each succeeding caudad portion of the neuraxis. Glycolysis of the medulla and cord decreases progressively with age. In all cerebral portions studied, lactic acid formation rises to a maximum at some time during development and then recedes in later life. The part of the brain exhibiting the highest glycolytic rate advances in a rostral direction as growth proceeds.

E. D. WALTER (Chem. Abstr.).

Glycolysis in the Brain. Mazza, V. F. P., and Lenti, C. [*Arch. sci. biol.* (*Italy*), **28**, 245–54 (1942); *cf. C.A.*, **32**, 9212[7]; **34**, 5903[3].]

Anaerobic glycolysis of brain suspension after removal of the enzyme which forms lactic acid showed no triose phosphate either with bisulfite or NH_2–NH_2 after action on glucose or glucose 6-phosphate. From fructose diphosphate PO_4 was liberated however. Electrodialysis after digestion likewise failed to give triose phosphates. Lactic acid was produced in quantity, however. These brain broth suspensions were unable to reduce methylene blue. These observations support the previous conclusions that both a phosphorylative and a non-phosphorylative glycolysis occur in the brain, the latter proceeding through keto acids to pyruvic and lactic acids.

WILLIAM F. BRUCE (Chem. Abstr.).

Anaerobic Glycolysis of the Brain in Experimental Poliomyelitis. Wood, Harland G., Rusoff, Irving I., and Reiner, John M. [*J. Exptl. Med.*, **81**, 151–9 (1945).]

The rates of anaerobic glycolysis of brain tissue were compared for normal animals and for those with experimentally induced poliomyelitis, with two different strains of mice and two different procedures. The report of interference of poliomyelitis with anaerobic glycolysis of brain was not confirmed. In one series there was a small increase and in the other series a small decrease in the brain Q $\frac{N_2}{CO_2}$ calculated for infected animals as compared with normal animals. When the calculations were made on the basis of wet weight of brain there was no difference in glycolysis. It is considered that the methods thus far used for study of the enzymes may be inadequate, and that no decision is as yet possible on the effect of poliomyelitis on anaerobic glycolysis.

C. J. WEST (Chem. Abstr.).

Alterations in the Central Nervous System Associated with Chronic Motor Disabilities Induced by O_2 at High Pressure. Bean, John W. [*Proc. Soc. Exptl. Biol. Med.*, **58**, 20–1 (1945).]

Preliminary. Repeated exposure of animals for short periods to O_2 at 65 lb. gauge pressure produced degenerative changes in the central nervous system after a prolonged series of such treatments. Animals that died after a relatively few treatments showed no such damage.

L. E. GILSON (Chem. Abstr.).

A Note on the Blood Guanidine Level in Migraine Subjects. Palmer, Harold D., Scott, D. B. McNair, and Elliott, K. A. C. [*J. Lab. Clin. Med.*, **28**, 735–7 (1943).]

The level of guanidine derivatives in the blood of migraine patients did not change before or during attacks. The basal level of guanidine-like substances in a number of epileptics was not higher than the normal level (*cf.* Murray and Hoffmann, *C.A.*, **34**, 6354[3]).

HOWARD W. ROBINSON (Chem. Abstr.).

The Hypophysis and Carbohydrate Metabolism. Implantation of Hypophysis and the Hyperglucemic Curve. del Castillo, Enrique B., Membrives, Juan Reforzo, and Luchetti, Santos E. [*Medicina* (*Buenos Aires*), **3**, 166–78 (1943).]

The implantation of bovine pituitaries in 12 patients, 11 of them with a low hypoglucemic curve, caused in every case an elevation of the level, moderate in some, intense in others. In some patients the maximal elevation was obtained a certain time after the implantation.

A. E. MEYER (Chem. Abstr.).

The Effect of $MgSO_4$ on the Superior Cervical Ganglion. Huidobro, F., and Luco, J. V. [*Anales acad. biol., Univ. catolica Chile*, **2**, 133–45 (1939).]

The nictitating membrane of cats under dial anesthesia is depressed by $MgSO_4$ both when the postganglionic fibers are stimulated electrically and when the smooth muscle is stimulated by adrenaline or acetylcholine. $MgSO_4$ produces a depression of the superior cervical ganglion followed by an increase when the ganglion is stimulated electrically or by acetylcholine. The depression of the nictitating membrane produced by prostigmine is partially neutralized by $MgSO_4$, and the administration of $MgSO_4$ during the paralyzing effect of curare produces a partial decurarization. The drugs were usually administered into the common carotid artery after ligation of the external carotid. Occasionally the intravenous route was used.

WM. M. GOVIER (Chem. Abstr.).

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Metabolism in Mental Disease. Hardwick, S. W. [*Med. Press and Circ.*, **210**, 347–50 (1943).]
A review covering such aspects as hypoglycemia, anoxia, vitamins, bio-chemical changes, periodic catatonia, autonomic enzymes, epilepsy, mechanism of shock therapy, and the endocrine approach. H. L. WILLIAMS (Chem. Abstr.).

Modern Views on the Role of the Hypothalamus. Biggart, J. Henry. [*Med. Press and Circ.*, **212**, 166–9 (1944).]
A review of the role of the hypothalamus in water, fat and carbohydrate metabolism, in sex disorders, in temperature regulation and in sleep. H. L. WILLIAMS (Chem. Abstr.).

Effect of Methyltestosterone Treatment on Muscular Performance and the Central Nervous System of Older Men. Simonson, Ernst, Kearns, Walter M., and Enzer, Norbert. [*J. Clin. Endocrinol.*, **4**, 528–34 (1944).]
In 6 men 48 to 67 years old, suffering from fatigability, oral treatment with 30 to 40 mgm. methyltestosterone daily increased back-muscle strength and fusion frequency of flicker above the levels observed when placebos were given. Dynamic and static work performances were increased in 4 of 5 subjects. These effects were maintained up to 8 months. Other muscle groups, heart rate recovery, etc., were unaffected. Conclusion: Increase in male sex hormone level can influence the decrease of working capacity with age.
KATHRYN KNOWLTON (Chem. Abstr.).

Inhibitory Processes of the Cerebral Cortex. Obrador Alcalde, S. [*Ciencia, Mex.*, **4**, 289–95 (1944).]
In line with Sherrington's formulations are investigations by the author demonstrating various patterns of cortical inhibition (transcortical, interhemispheric, etc.) obtained in motor areas. Polygraph records support the view that inhibition is an active process (samples are reproduced), " and perhaps suggest a variety and diversity of causal factors." The basic nature of inhibition is still unknown. H. D. SPOERL (Pyschol. Abstr.).

The Effects of Retrograde Degeneration upon Reflex Activity of Ventral Horn Neurons. Campbell, B. [*Anat. Rec.*, **88**, 25–38 (1944).]
Cats and rhesus monkeys were used in the experiments; dial anesthesia was used during observations. Data were obtained by stimulation and recording with the cathode ray oscillograph. The author concludes: (1) Section of peripheral nerves or of ventral roots in cats and monkeys leads to the loss of the proprioceptive component of the spinal reflex during the period of chromatolysis. (2) This is directly correlated with the alteration of the ventral horn cell, and does not stem from degeneration in the sensory system. (3) Conduction occurs from the peripheral to central fibers of the dorsal root ganglion cells after retrograde degeneration induced by nerve section. S. R. HATHAWAY (Psychol. Abstr.).

Biochemical Problems of the Determination of the Nervous System in the Vertebrate Embryo. Nowinski, W. W. [*Medicina (Buenos Aires)*, **3**, 235–49 (1943).]
The substances which may play a role as stimulator in the embryonic development of the nervous system are discussed. A. E. MEYER (Chem. Abstr.).

Influence of Histamine on the Actions of Acetylcholine and Cholinesterase. Frommel, E., Aron, E., Herschberg, A. D., Piquet, J., and Goldféder, A. [*Helv. Physiol. Pharmacol. Acta*, **2**, 111–20 (1944) (*in French*).]
Histamine, 40γ/c.c., sensitizes leech muscle, snail heart, and frog rectus abdominis muscle to acetylcholine much in the same manner as does eserine. *In vitro*, the cholinesterase of guinea-pig and human serums, but not of horse serum, is partially inhibited by histamine, 10–100γ/c.c. During histamine-induced shock in guinea-pigs the cholinesterase activity of the serum is not significantly altered. L. E. GILSON (Chem. Abstr.).

Effect of Blood Serum from Patients with Myasthenia Gravis on the Synthesis of Acetylcholine in vitro. Torda, Clara, and Wolff, Harold G. [*J. Clin. Investigation*, **23**, 649–56 (1944); *cf. C.A.*, **38**, 5954[3].]
Acetylcholine synthesis in frog brain-Ringer solution mixtures was greater at 23° than at 38°, while the reverse was true of frog brain-serum mixtures. In frog brain-control serum mixtures or in frog brain-dialyzate of control-serum mixtures, acetylcholine synthesis exceeded that from frog brain-Ringer solution mixtures. The synthesis was significantly less when mixtures of serum from patients with myasthenia gravis were used. These results suggest that there is a defect in acetylcholine synthesis in patients with this disease which can explain the fatigability and weakness of these patients. J. B. BROWN (Chem. Abstr.).

Action of Acetylcholine on Erythropoiesis in Aplastic Anemia. Cremer, J. [*Z. klin. Med.*, **143**, 300–6 (1943).]
In three patients the repeated injection of increasing doses of acetylcholine caused the appearance of more reticulocytes in the blood, but did not significantly increase the total red cell count or the hemoglobin content. L. E. GILSON (Chem. Abstr.).

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2-Methyl-1, 4-Naphthoquinone and Its Relation to Choline. René Honorato, C., and Davidovich, A. [*Rev. med. y alimentación (Santiago, Chile)*, **5**, 78–83 (1942–43).]

A study of the mechanism of the action of 2-methyl-1, 4-naphthoquinone showed the importance of the 2-methyl group. Acetylcholine, β-methylnaphthalene and vitamin K in 150-γ doses given daily to chicks (on a vitamin K-free diet) altered the mortality and prothrombin time (Quick), acetylcholine, and vitamin K reducing the mortality from the "normal" of 70 per cent. (30 days on diet) to 26·6 and 35 per cent., respectively, and the prothrombin time from 130 minutes (23 days on diet) to 40 minutes and 23 minutes respectively, and from 45 minutes (29 days on diet) to 22 and 20 minutes respectively. Acetylcholine also lowered the prothrombin time in human subjects with an elevated value. In chicks β-methylnaphthalene increased the mortality to 85 per cent. and increased the prothrombin time above the control at first. *In vitro*, under conditions in which vitamin K did not coagulate the plasma, acetylcholine brought this about, particularly at 37°, and after incubation for 5–15 minutes with the thromboplastin and plasma. The possibility that this incubation period arising from decomposition of the acetylcholine by cholinesterase was indicated by the absence of the incubation effect with choline, although incubation favoured its action. H. L. WILLIAMS (Chem. Abstr.).

2-Methyl-1, 4-Naphthoquinone, Choline and β-Methylnaphthalene in Experimental K Avitaminosis-preventative and Curative Levels. René Honorato, C., and Merino, V. García. [*Ibid.*, 220–1.]

In avitaminosis K in chicks the curative doses of 2-methyl-1, 4-naphthoquinone, choline and β-methylnaphthalene are about ten times the preventive doses. The favourable effect of the three compounds in bringing the prothrombin times of vitamin K-deficient chicks toward normal was confirmed. H. L. WILLIAMS (Chem. Abstr.).

Action of Thyroxine and Choline in vitro *on the Prothrombin Time. René Honorato, C., and Aravena, M.* [*Ibid.*, 221–3.]

In normal plasma diluted 1/3 with physiol. saline there is no change in prothrombin time with choline, thyroxine or mixtures of the two. When these substances, and particularly the mixture, are activated by heating at 70° before using in the test the prothrombin time is decreased. The mechanism of the action is not known. H. L. WILLIAMS (Chem. Abstr.).

Effects of Choline and Acetylcholine Chloride upon Peripheral Nerve Fibers. Lorente de No, Rafael [*J. Cellular Comp. Physiol.*, **24**, 85–97 (1944).]

By the use of the sciatic nerve of the bullfrog, an analysis has been made of the action of large concentrations of choline and acetylcholine chlorides upon the resting membrane potential and upon the ability of the nerve to conduct impulses. These substances, even at concentrations of about 0·1 M, do not depolarize the nerve fibers, nor do they prevent the conduction of nerve impulses. Their action upon the membrane potential of nerve during anoxia and the subsequent period of recovery resembles that of Mg ions. And insofar as choline and acetylcholine chlorides in a concentration of about 0·1 M maintain the osmotic equilibrium of the nerve fibers, their action resembles that of glucose. A. D. HASLER (Chem. Abstr.).

Determination of Free Choline in Animal Tissues. Luecke, R. W., and Pearson, P. B. [*J. Biol. Chem.*, **155**, 507–12 (1944).]

The microbiological method for measuring free choline in plasma and urine (*cf. C.A.*, **38**, 3685[6]) has been adapted to the determination of this compound in animal tissues. Values for free choline in fresh beef liver range from 0·08 to 0·20 mgm. per gm., and this represents approximately 2 per cent. of the total choline in the liver. Incorporation of 1 per cent. choline in the diet of the rat is accompanied by a rather large increase in the free choline content of the kidney. No corresponding increase is seen in liver or brain tissue. A. E. TEERI (Chem. Abstr.).

Strain Differences in the Choline Requirement of Rats. Copeland, D. H. [*Proc. Soc. Exptl. Biol. Med.*, **57**, 33–5 (1944).]

The minimum choline requirement of a selected Wisconsin strain of hooded rats was approximately 4–6 mgm. per rat per day, and that of a Wistar albino strain on the same diet was above 10 mgm. per rat per day. Tests on the progeny of each strain showed that this difference continued through the F_3 generation. L. E. GILSON (Chem. Abstr.).

The Effects of K on the Synthesis of Acetylcholine in Brain. Welsh, John H., and Hyde, Jane E. [*Am. J. Physiol.*, **142**, 512–18 (1944).]

The findings of Mann *et al.* (*C.A.*, **33**, 8271[4]) were confirmed, namely, that at 7 to 8 times the K of normal Locke's solution the synthesis of acetylcholine (I) by brain slices in O was maximal; at about 12 times K+ the release of (I) was maximal; further increase in K+ resulted in a decrease in (I) formation. Slices of infant brain behaved essentially as adult except that the yields of (I) were not as great. Under anaerobic conditions very little (I) is synthesized at 0·004 M K+ and increasing the K+ to 0·05 M causes a possibly significant slight decline in total (I). More than one action of K+ is probably responsible for its observed effects on (I) formation and release. E. D. WALTER (Chem. Abstr.).

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The Cholinesterases in the Light of Recent Findings. *Mendel, Bruno, and Rudney, Harry.* [*Science*, **100**, 499–500 (1944); *cf. C.A.*, **38**, 984[6].]

Chiefly a review and discussion emphasizing the existence of two distinct cholinesterases in the animal body; a specific or true cholinesterase, hydrolyzing choline esters exclusively, and a nonspecific or pseudocholinesterase capable of hydrolyzing a variety of esters, including those of choline. E. D. WALTER (Chem. Abstr.).

Specificity of Cholinesterase in Nervous Tissue. *Nachmansohn, David, and Rothenberg, Mortimer A.* [*Science*, **100**, 454–5 (1944); *cf. C.A.*, **37**, 5473[3].]

Evidence is presented that the enzyme present in various nerve tissues, on which the role of acetylcholine in the mechanism of nervous action was studied, is a specific enzyme. The results provide further support for the new concept of the role of acetylcholine in the mechanism of nervous action. E. D. WALTER (Chem. Abstr.).

Role of Acetylcholine and Vitamin B_1 in Nervous Excitation. *Murali, A. v.* [*Nature*, **154**, 767–8 (1944); *cf. C.A.*, **37**, 6311[9].]

Stimulation of the branch of the vago-sympathicus supplying the heart of the frog leads to the liberation of aneurine or an aneurine compound tentatively called "2. *Vagusstoff*," in addition to acetylcholine, which Lowi originally called "*Vagusstoff*." The experiments confirm the conception that acetylcholine formation is essential for the excitation or recovery process, and that aneurine is a reservoir substance closely connected with the formation and disappearance of acetylcholine. E. D. WALTER (Chem. Abstr.).

An Analysis of the Mode of Action of Acetylcholine as Chemical Agent of Nervous Excitation. *Koshtoyants, Kh. S.* [*Doklady Akad. Nauk S.S.S.R.*, **43**, 376–9; *Compt. rend. acad. sci. U.R.S.S.*, **43**, 357–9 (1944) (*in English*).]

The action of acetylcholine (I) on the rectus abdominis muscle of the frog was suppressed by treating the muscle with Na oxalate solution. Normal response was restored by transferring the muscle back to Ringer solution. This indicates that (I) stimulates muscle by releasing Ca ions which are known (*cf. C.A.*, **36**, 6178[2]) to activate adenosinetrophosphatase (II). The paradoxical effect of (I) on heart muscle is attributed to action of (I) on such muscle to release Mg and K ions, known (*cf. C.A.*, **37**, 1728[6]) to inhibit (II) strongly. J. W. P. (Chem. Abstr.).

Decomposition Products of Nucleoproteins and Related Substances and Muscle Sensitivity to Acetylcholine and to K. *Torda, Clara, and Wolff, Harold G.* [*Proc. Soc. Exptl. Biol. Med.*, **58**, 29–31 (1945).]

The effect on the contraction of frog rectus abdominis muscle induced by acetylcholine (I) or KCl was studied. Adenosine, adenine, adenylic acid and uric acid did not modify the effect of (I). Xanthine, methylxanthines, uracil, thiouracil, pyridine, 2-methyl-5-ethoxymethyl-6-aminopyrimidine, 4-methyl-5-β-hydroxyethylthiazole, methylguanidine, and "pyrol" did not modify the effect of (I) when used in low concentrations, but in higher concentrations increased its effect. Nucleic acid, alloxan and piperidine decreased the effect of KCl in inducing muscle contraction; the other compounds mentioned above increased its effect. L. E. GILSON (Chem. Abstr.).

Acetylcholine Formation in Cell-free Extracts from Brain. *Feldberg, W., and Mann, T.* [*J. Physiol.*, **103**, 28–9P (1944).]

The enzyme system which catalyzes the formation of acetylcholine in the presence of adenosine triphosphate (ATP) has been obtained in the form of cell-free solutions, prepared by extraction of acetone-dried and powdered rat brain. In one hour at 37°, 140–400γ/gm. acetylcholine was formed, corresponding to 500–1,430γ/gm. dry material in the extract. About half of this acetylcholine was formed aerobically, but reduced glutathione or cysteine brought the aerobic synthesis to almost the same level observed anaerobically. Oxidized glutathione or cystine inhibited acetylcholine formation in air or N. The extracts only very slowly liberated orthophosphate from ATP, and the rate was the same in the presence or absence of O_2 and was unaffected by the presence of choline. ATP could not be replaced by adenosine diphosphate, inosine triphosphate or adenylate. Glucose, fructose and certain phosphorylated sugar derivatives inhibited the formation of acetylcholine—a fact explained by esterification of the labile phosphate groups of ATP. The formation of acetylcholine was enhanced by K+, diminished by Ca++. Ca++ inhibited, but K+ did not affect, the liberation of inorganic phosphate from ATP. H. L. WILLIAMS (Chem. Abstr.).

The Choline-containing and Non-choline-containing Phospholipides of Plasma. *Taurog, Alvin, Entenman, C., and Chaikoff, I. L.* [*J. Biol. Chem.*, **156**, 385–91 (1944); *cf. C.A.*, **38**, 6316[6].]

A study was made of the choline and P contents of plasma phospholipides of man and dog in the post-absorptive state. Choline was extracted by two methods and the phospholipides calculated from the P analysis. From the choline to P ratios, 95 per cent. or more of the plasma phospholipide of man and dog was found to contain choline. A. DIETZ (Chem. Abstr.).

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Effect of Vitamin K (Menadione) on Cholinesterase Activity, Acetylcholine Synthesis and Striated Muscle. Torda, Clara, and Wolff, Harold G. [*Proc. Soc. Exptl. Biol. Med.*, **57**, 236–9 (1944).]

The synthesis of acetylcholine by frog brain *in vitro* is retarded by 2-methyl-1, 4-naphthoquinone in concentrations of $2/10^6$ M or higher. The activity of cholinesterase is not affected by concentrations up to 0·001 M, but is decreased by higher concentrations. Menadione increased the effect of KCl in inducing muscle contraction. The effect was not easily reversed. In high concentration (0·0025 M) menadione alone caused contraction of striated frog muscle *in vitro*. The effect of methylene blue is similar except that cholinesterase activity is more completely inhibited. The possible mechanism of the above actions is discussed.

L. E. Gilson (Chem. Abstr.).

Effect of Steroid Substances on Synthesis of Acetylcholine. Torda, Clara, and Wolff, Harold G. [*Proc. Soc. Exptl. Biol. Med.*, **57**, 327–30 (1944); *cf. C.A.*, **38**, 4966[6]; **39**, 738[1].]

Cholesterol did not affect the rate of synthesis of acetylcholine by minced frog brain at pH 7·4 and 37°. Bile salts and vitamin D had no effect in low concentrations; higher concentrations depressed the rate. Hormones of the mammalian adrenal cortex, male sex hormones and corpus luteum hormones, except pregnenolone, depressed the rate, while estrogenic hormones and pregnenolone had an accelerating action. L. E. Gilson (Chem. Abstr.).

Reineckate Method for the Determination of Choline. Glick, David. [*J. Biol. Chem.*, **156**, 643–51 (1944).]

The method depends on photo-electric measurement of the color intensity of the acetone solution of choline reineckate. MeOH is the best extractant, and it has been determined that it is not necessary to employ reduced pressure for removal of this solvent before liberating the choline by $Ba(OH)_2$ hydrolysis. The interference due to many compounds which form insoluble reineckates is circumvented by precipitating in an alkaline medium. It was determined that propanol is the most suitable wash solution, since Reinecke salt is quite insoluble in it. The maximum light absorption for choline reineckate is near 526mμ, as determined spectrophotometrically. A. E. Teeri (Chem. Abstr.).

Rapid Biological Method for the Approximate Determination of Acetylcholine and K in Body Fluids. Torda, Clara. [*J. Lab. Clin. Med.*, **28**, 1609–14 (1943).]

The method is based on the antagonism between Ca and K on the contraction of the rectus abdominis muscle of the frog. A large excess of Ca influences only slightly the contracting effect of acetylcholine on the muscle, while it prevents almost entirely the contraction caused by K. Acetylcholine, K or both, were added to urine and the added amount was determined by the test. The difference between the amount added and that estimated was ± 15 per cent.

H. W. Robinson (Chem. Abstr.).

Inhibition of Choline Acetylase by α-Keto Acids. Nachmansohn, David, and John, Hedda M. [*Proc. Soc. Exptl. Biol. Med.*, **57**, 361–2 (1944).]

From brain tissue an enzyme, *choline acetylase*, can be extracted which in presence of adenosine triphosphate under strictly anaerobic conditions synthesizes acetylcholine in cell-free solution. Presence of eserine and fluoride is necessary to inhibit the action of accompanying cholinesterase and adenosinetriphosphatase. Pyruvic, α-ketoglutaric, phenylpyruvic and hydroxyphenylpyruvic acids inhibit its action more or less in concentrations above 0·0001 M. α-Keto acids occur in living cells in concentrations close to those found to have an inhibiting action on choline acetylase; this may be of considerable physiological importance.

L. E. Gilson (Chem. Abstr.).

The Cerebrospinal Fluid in Metastatic Tumors. Shannon, Edward W., and Morgan, Clinton W., jun. [*New Engl. J. Med.*, **231**, 874–5 (1944).]

Metastatic neoplasms cannot be differentiated from primary brain tumours on the basis of the protein content of the cerebrospinal fluid alone. The average protein content of lumbar cerebrospinal fluid in 43 cases of metastatic brain tumors was 99 mgm. per cent., and in 91 per cent. of the cases the content was greater than 40 mgm. per cent. The highest content was found in cases with superficial cerebral metastases. Patients with supratentorial metastases had a higher cerebrospinal fluid protein content than those with subtentorial lesions.

E. R. Main (Chem. Abstr.).

The Effects of Intracisternal Injection of NaBr upon the Blood-spinal Fluid Barrier. Weir, Everett G. [*Am. J. Physiol.*, **143**, 83–8 (1945); *cf. C.A.*, **38**, 6619[9].]

Intracisternal injections of NaBr, in amounts too small to alter the serum bromide level, lower the barrier to the passage of bromide ion into the spinal fluid. The distribution ratio of K and chloride ion is affected also by this procedure. Analysis of the spinal fluid after intracisternal injection shows that the fluid more closely resembles an ultrafiltrate of serum than before the injection. E. D. Walter (Chem. Abstr.).

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The Composition of the Spinal Fluid in Alcoholic Korsakow Psychosis as an Example of Spinal-fluid Findings in Organic Psychosyndromes. Reinhart, Walter. [*Schweiz. Arch. Neurol. Psychiat.*, **53**, 326–38 (1944).]

Total protein, globulin; protein quotient, cells, and Nonne, Pandy, normomastic and gold sol reactions were determined in the spinal fluid from 20 patients with alcohol Korsakow psychosis and from 95 patients with chronic alcoholism alone. In 11 of the Korsakow and 79 of the alcoholic patients the findings were normal throughout. In the others one or more of the tests were abnormal. Most of these could be explained by complications, but about 8 per cent. of the total number in each group showed spinal fluid abnormalities apparently resulting directly from the disease. Since the percentage was the same in both groups, it is concluded that no specific spinal fluid changes are associated with the Korsakow syndrome.

WARREN M. SPERRY (Chem. Abstr.).

Nonprotein N and Protein Concentration of Serum and Cerebrospinal Fluid in Shock. Duncan, Geo. W., Irvin, J. Logan, and Sarnoff, Stanley J. [*Bull. Johns Hopkins Hosp.*, **75**, 135–43 (1944).]

Mean concentrations of both non-protein N and protein in serum and cerebrospinal fluid were significantly greater in animals in which shock had been produced by a crushing injury. The mean ratios of the concentration of non-protein N in serum to the corresponding values in spinal fluid were 1·58 for control animals and 2·02 for the animals subjected to shock. The mean ratios of the concentration of protein in serum to that in spinal fluid were essentially the same for both groups.

ZELMA B. MILLER (Chem. Abstr.).

Considerations about our Latest Examinations of the Cerebrospinal Fluid in (Cases of) Heine-Medin's Disease. Macome, Alberto M., and Guidice, Carlos R. [*Rev. asoc. bioquím. argentina*, **11**, *No.* 38, 173–90 (1944).]

Positive globulin reactions were found in 37 per cent. of the fluids taken in the paralytic period of the disease, while the reaction was negative in the initial stage. Total proteins were increased to 50–200 mgm. per cent. in the paralytic period. Glucose was slightly higher, but within the normal limits. The chloride content remained unchanged. Lange's reaction with colloidal Au was positive, but atypical in 62 per cent. of the cases. The Wassermann reaction was always negative.

F. FROMM (Chem. Abstr.).

A Method for Exact Protein Determination in Small Quantities of Spinal Fluid. Rappaport, F., and Lasowski, E. [*J. Lab. Clin. Med.*, **28**, 1640–2 (1943).]

This method employs very small quantities of spinal fluid, 0·5 c.c. to 1 c.c. being sufficient for a determination. The total proteins of the spinal fluid are precipitated with phosphomolybdic acid. The sediment, after centrifugation, is dissolved in dilute NaOH and transferred quantitatively to a micro Kjeldahl flask for digestion. The digested contents are treated as in non-protein N determinations (*cf. C.A.*, **31**, 8560[6]).

H. W. ROBINSON (Chem. Abstr.).

The Clinical Estimation of Protein in the Cerebrospinal Fluid. Campbell, Walter R., and Hanna, M. I. [*Can. Med. Assoc. J.*, **51**, 347–50 (1944).]

A rapid clinical test for protein in the cerebrospinal fluid has been devised by preparing standard protein solutions from lyophilized serum. The protein solutions may be kept two weeks in an ice chest if a small crystal of thymol is added to the solutions and the solutions are tightly corked. A biuret reagent, stable for some months, is prepared by adding 100 c.c. of a 1 per cent. $CuSO_4.5H_2O$ solution dropwise with constant shaking to 100 c.c. of a 50 per cent. (wt./vol.) NaOH solution. (The NaOH solution is freshly prepared by dilution from a concentrated solution which has been left standing until the carbonates and iron settle out.) Dilute standard protein solutions are made from water and standard protein solution up to 2 c.c. in volume. To this is added 0·3 c.c. biuret reagent. The solutions are mixed, allowed to stand three minutes and compared in a colorimeter with the cerebrospinal fluid treated with biuret reagent. The colors are stable for several hours. A photoelectric colorimeter may be used, a graph for comparison having been prepared from standard protein solutions.

G. H. W. LUCAS (Chem. Abstr.).

Vitamin B_2 and the Nervous System. Chauchard, Mme. B., Chauchard, P., and Raffy, A. [*Compt. rend. soc. biol.*, **137**, 45–6 (1943).]

See *C.A.*, **38**, 1003[8].

L. E. GILSON (Chem. Abstr.).

Distribution of Free and Combined Nicotinic Acid. Marenzi, A. D., and Moglia, J. L. [*Anales farm. bioquím. (Buenos Aires)*, **15**, 8–25 (1944); *cf. C.A.*, **38**, 2364[2].]

Rats were given 25 mgm. nicotinic acid (I) intraperitoneally and free and combined (I) were determined in the tissues 15, 30, 60, 120 and 180 minutes later. The (I) was absorbed and distributed throughout the tissues in less than 15 minutes. The liver, heart and kidneys showed a large and prolonged increase in free (I). Skeletal muscles showed a smaller increase. Com-

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bined (I) increased most in the heart and almost as much in the liver; perhaps free (I) was converted into trigonelline in these organs. Later, the muscles showed an increase in combined (I), possibly transferred there from the liver. In the kidneys the increase was slight.

L. E. GILSON (Chem. Abstr.).

Comparative Effects of Vitamin B_1 Deficiency and Restriction of Food Intake on the Response of Mice to the Lansing Strain of Poliomyelitis Virus, as Determined by the Paired Feeding Technique. Foster, Claire, Jones, James H. Henle, Werner, Dorfman, Frieda, Quinby, Mabel E., and Alexander, Dorothy L. [*J. Exptl. Med.*, **80**, 257–64 (1944); *cf. C.A.*, **38**, 1548[1].]

In a paired feeding experiment the effects of vitamin B_1 deficiency and of restriction of food intake have been compared. In both groups of animals the number of cases of paralysis and the number of deaths were less than in a control group on an unrestricted amount of the complete diet. The maximum difference occurred on the 15th day after inoculation. The incidence of paralysis and death in the vitamin-deficient group was also less than in the paired restricted group. The maximum difference occurred on the 17th day after inoculation, after which the difference gradually became less. At the end of the experiment (28 days) there was a slightly greater number of deaths in the restricted group than in the vitamin-deficient group. Apparently the effect of vitamin B_1 deficiency on the action of the virus of poliomyelitis in the mouse is not due solely to the resulting anorexia.

C. J. WEST (Chem. Abstr.).

Brain Lesions Following Prolonged Overdosage with Desoxycorticosterone Acetate. Selye, Hans, Beland, Eleanor, and Sylvester, Octavia. [*Exptl. Med. Surg.*, **2**, 224–8 (1944); *cf. C.A.*, **37**, 5143[3].]

In rats sensitized to desoxycorticosterone acetate (I) by unilateral nephrectomy and a high salt intake (1 per cent. saline instead of drinking water), subcutaneous injection of 2 mgm. (I) in 0·1 c.c. water twice a day for 38 days or absorption of slightly less than 1 mgm. (I) daily from a subcutaneously implanted 15-mgm. pellet caused motor disturbances, cerebral periarteritis nodosa, and malignant nephrosclerosis.

MARION HORN PESKIN (Chem. Abstr.).

Relationship of Vitamins to Nervous and Mental Changes in Chronic Alcoholics with Special Reference to Vitamin C. Wortis, Herman. [*Proc. Pacific Sci. Congr., Pacific Sci. Assoc.*, **6**, 475–80 (1943).]

The part played by vitamin deficiency in the production of nervous and mental changes in chronic alcoholics is discussed. Vitamin C appears to be involved in nerve-tissue metabolism, although its role is probably a subordinate one.

L. E. GILSON (Chem. Abstr.).

The Influence of Sex Hormones upon the Chemical Growth of the Brain of White Rats. Weil, Arthur. [*Growth*, **8**, 107–15 (1944); *cf. C.A.*, **37**, 6315[8].]

In immature white rats the P content of the cephalin fraction of the brain is somewhat higher in males than in females; after puberty the opposite is the case. Injections of α-estradiol benzoate (I) into immature males reduced the P content of this fraction, and injections of testosterone propionate (II) into immature females raised it. The P content was not affected by administration of (I) to females nor by administration of (II) to males. Effects similar to those described above were exhibited by (I) and (II) in rats gonadectomized before or after puberty.

MARION HORN PESKIN (Chem. Abstr.).

The Pyruvic Acid Content of Human Blood in Pellagra. Tsatsakos, Demetrius. [*Klin. Wochschr.*, **22**, 442–4 (1943); *Chem. Zentr.*, **2**, 1475 (1943).]

Increased amounts of pyruvic acid in the blood (1–1·6 mgm. per 100 c.c.) were found in 20 cases of pellagra. This increase is attributed to the incomplete cleavage or dismutation of pyruvic acid in the organism (decrease of the cozymase content because of the deficient supply of nicotinic acid).

RUTH BERGGREN (Chem. Abstr.).

Ascorbic Acid Excretion and Insomnia. Burton, Helen B., and Miller, Laura A. [*Proc. Okla. Acad. Sci.*, **24**, 17–20 (1944).]

A study was made as to whether the amount of sleep has any effect on the body's need for ascorbic acid (I) as measured by the excretion of (I). Two subjects were studied, and excretion values of one indicated a slight decrease in (I) after wakeful nights. The excretion values of the other subject were irregular, with inconclusive results.

H. J. PREBLUDA (Chem. Abstr.).

A Study of Canine Hysteria Produced by Feeding Certain Baked Dog Foods and Wheat Gluten Flour. Wagner, J. R., and Elvehjem, C. A. [*J. Nutrition*, **28**, 431–41 (1944).]

Canine hysteria of the nutritional type was produced in dogs by feeding baked dog foods containing wheat gluten flour and experimental rations containing wheat gluten flour. The disease appears to be caused by some toxic factor present in the wheat products. Although the proteins of these products are deficient in lysine, supplements of protein and lysine did not prevent the disease. Hysteria could be caused in dogs receiving nutritionally adequate rations by the addition of wheat gluten flour.

W. B. ESSELEN, jun. (Chem. Abstr.).

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Absence of Nerve Degeneration in Chronic Thiamine Deficiency in Pigs. Wintrobe, Maxwell M., Follis, Richard H., jun., Humphreys, Stewart, Stein, Harold, and Lauritsen, Marjorie. [*J. Nutrition*, **28**, 283–8 (1944); *cf. C.A.*, **38**, 569[5].]

Additional experiments in pigs in which chronic thiamine deficiency was produced failed to support the claim that lack of thiamine causes degenerative changes in the nervous system. Autoclaving was found to destroy thiamine and to reduce the pantothenic acid content of yeast fed in the diets. It was suggested that certain effects heretofore attributed to lack of thiamine may have in reality been due to lack of pantothenic acid.

W. B. Esselen, jun. (Chem. Abstr.).

Comparative Toxicity of Pentobarbital in the Newborn and Adult Rat. Etsten, B., Alexander, F. A. D., and Himwich, H. E. [*J. Lab. Clin. Med.*, **28**, 706–10 (1943).]

The lethal dose of pentobarbital for the newborn rat is 0·3 mgm. per gm., while the adult rat does not succumb until it has received 0·5 mgm. per gm. It appears that pentobarbital inhibits the development of the anaerobic energy required for survival in the absence of O. Doses of pentobarbital and metrazole, which are lethal when given singly, may antagonize each other and promote survival when given together. Howard W. Robinson (Chem. Abstr.).

3. Pharmacology and Treatment.

Barbiturates. XXVII: Tolerance and Cross Tolerance to Barbiturates. Green, Melvin W., and Koppanyi, Theodore. [*Anesthesiology*, **5**, 329–40 (1944); *cf. C.A.*, **38**, 993[5].]

Dogs, upon repeated daily injections of evipal-Na, pentothal-Na, and nostal-Na, develop a marked tolerance to these drugs characterized by a significant reduction in sleeping time. With nostal, anesthetic doses eventually fail to produce sleep in tolerant animals. Dogs made tolerant to evipal, pentothal or nostal show cross tolerance to the other two barbiturates, and also to the long-acting barbital-Na. The tolerance to barbiturates is not lasting. Pentothal-tolerant animals practically lose all their tolerance in less than two weeks. Dogs which developed tolerance to the narcotic action of evipal failed to show tolerance to the peripheral actions of this hypnotic, namely, vasodepression, vagal paralysis, and prevention of the elevation of blood pressure after occlusion of the common carotid artery. The tolerance to the narcotic action of these barbiturates is probably a true cellular tolerance. The development of this phenomenon can only be obtained by a careful balance between the rate of administration and the rate of essential elimination; in other words, it may be obscured either by cumulative effects or by partial loss of tolerance between administrations. Ruth Berggren (Chem. Abstr.).

Experimental Treatment of Barbiturate Poisoning with Picrotoxin. Caizzone, Giacomo, and Rigano, Giuseppe. (*Arch. ital. sci. farmacol.*, **9**, 231–48 (1939); *Chem. Zentr.*, **1**, 563 (1944).]

In rabbit experiments picrotoxin proved to be a better antidote than strychnine for barbiturate poisoning. L. E. Gilson (Chem. Abstr.).

Antagonism of Na Succinate to Barbiturate Depression. Pinschmidt, N. W., Ramsey, Helen, and Haag, H. B. [*J. Pharmacol.*, **83**, 45–52 (1945).]

Repetition of the experiments of Soskin and Taubenhaus (*C.A.*, **37**, 4471[6]) on use of Na succinate as an antidote to barbiturate poisoning in hooded rats gave results similar in nature but less striking. Pre-administration of 1 gm. of succinate per kgm. of body weight protected 80 per cent. of the treated rats against death from 8·5 mgm. of Na pentobarbital per kgm., whereas only 47·5 per cent. of the controls survived. In an identical experiment with albino rats 70 per cent. of the treated rats and 50 per cent. of the controls recovered. Na succinate shortened the duration of Na pentobarbital anesthesia in rabbits to a limited extent. It was far less effective than a moderate dose of picrotoxin. L. E. Gilson (Chem. Abstr.).

Influence of Some Analeptics on Activity of Narcotics. Giovanna, G. Della. [*Arch. ital. sci. farmacol.*, **8**, 35–50 (1939); *Chem. Zentr.*, **1**, 562 (1944).]

Narcotics such as $CHCl_3$ and CBr_3CH_2OH flocculate soap gels. In animal experiments analeptics, such as coramine, caffeine, metrazole, camphydrol and strychnine antagonize the action of these narcotics. They also inhibit the flocculation of soaps by the same. Na barbital has scarcely any flocculating action on soap, and its action is not affected by the above analeptics.

L. E. Gilson (Chem. Abstr.).

Benzedrine in Contrast to Barbiturate Action. Carratala, Rogelio. [*Semana med.* (*Buenos Aires*), **1**, 1229–34 (1944).]

The minimum lethal dose was determined for various barbiturates and benzedrine in dogs, rabbits and rats. Benzedrine, injected first, delays the coma after minimum lethal doses of barbiturates, but does not prevent death in all animals. If benzedrine is given after barbiturate coma has developed it is possible to awake the animals or shorten the coma, but not to save all the animals. Benzedrine is inferior to coramine, metrazole, strychnine and picrotoxine. Barbiturate narcosis can be prevented with preceding injections of benzedrine. Established narcosis can be interrupted with benzedrine. The effect of benzedrine can effectively be counteracted with barbiturates. A. E. Meyer (Chem. Abstr.).

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The Influence of Amphetamine (Benzedrine) Sulfate, d-Desoxyephedrine Hydrochloride (Pervitin), and Caffeine on Work Output and Recovery when Rapidly Exhausting Work is Done by Trained Subjects. *Foltz, E. E., Ivy, A. C., and Barborka, C. J.* [*J. Lab. Clin. Med.*, **28**, 603–6 (1943).]

The effects of amphetamine (I), desoxyephedrine (II) and caffeine (III) on work output and the effect of (I) and (II) on recovery in subjects doing rapidly exhausting work have been observed. All three drugs stimulated some of the subjects mentally so that they felt more alert. The sensations resulting from (II) and (III) were more pronounced when the drugs were given to a non-fatigued subject than when given following exhaustion. The subjects could not work longer and did not recover more rapidly when given (I). If (II) was given before work began the subjects worked longer, but recovery was not hastened if (II) was given to exhausted subjects. The subjects worked longer when given (III), and recovery was hastened if (III) was given to exhausted subjects. These experiments do not pertain to the type of work performed during a march or while standing guard. Stimulants should be chosen according to whether increased work output is desired, or whether more rapid recovery from fatigue is necessary.

HOWARD W. ROBINSON (Chem. Abstr.).

The Influence of Amphetamine (Benzedrine) Sulfate and Caffeine on the Performance of Rapidly Exhausting Work by Untrained Subjects. *Foltz, E. E., Schiffrin, M. J., and Ivy, A. C.* [*J. Lab. Clin. Med.*, **28**, 601–3 (1943).]

Twenty-three untrained subjects were given capsules containing a placebo, or 10 mgm. of amphetamine, or 0·5 gm. of caffeine sodium benzoate. The output of work was the same regardless of the capsule taken, but training had a much greater effect on the output of work. No side effects were noted from the drugs except that most of the subjects felt euphoric and as if they could do "a lot of work to-day." The euphoria did not increase the work output. The average percentage of recovery was very constant. H. W. ROBINSON (Chem. Abstr.).

Action of Pentamethylenetetrazole (Metrazole) on the Superior Cervical Ganglion of the Cat. *Croxatto, H., and Alonso, O.* [*Rev. med. y alimentación (Santiago, Chile)*, **5**, 57–8 (1942–43); *cf. C.A.*, **38**, 5578[1].]

Metrazole has a depressing effect upon the superior cervical ganglion.

H. L. WILLIAMS (Chem. Abstr.).

Effects of Pentamethylenetetrazole on the Neuromuscular Synapses. *Salvestrini, H., Croxatto, H., Alonso, O.* [*Ibid.*, 58–60.]

The response to indirect stimulation is depressed, in a manner similar to that observed with strychnine. H. L. WILLIAMS (Chem. Abstr.).

Mode of Action of Pentamethylenetetrazole or Metrazole on the Nervous Centers. *Chauchard, Paul, Mazoué, Henriette, and Lecoq, Raoul.* [*Compt. rend.*, **217**, 619–21 (1943).]

The mode of action of metrazole was studied with subconvulsive doses injected intraperitoneally into rabbits, guinea-pigs and rats. The rabbits received 3–15 mgm. (the convulsive dose is 50 mgm. given intravenously and 150 mgm. intraperitoneally). The guinea-pigs and rats received 3 mgm. The observations were carried out on the intact animals (Chauchard, *C.A.*, **38**, 1770[9]; Chauchard, A., B., and P., *Compt. rend. soc. biol.*, **136**, 784 (1942)), and concerned the chronaxies of the nerves to extensors and flexors of the toes, the corresponding muscular chronaxies, the sensory chronaxies of the reflex of crossed flexion of the paw, and the cortical chronaxies of flexion of the toes, the electrodes being applied to the skin at desired points. It was found that in addition to its action on the muscles, metrazole has complex effects on the nervous centers. The higher centers, especially the cerebral cortex, are depressed, while the lower centers are excited. To the idea of the role of the lower centers in the genesis of metrazole convulsions (J. Asuad, *Presse méd.*, **48**, 794, 1043 (1940)) is now added the idea of a cortical depression, to which is to be attributed the loss of consciousness observed in man. The nervous disturbances provoked by metrazole are indentical to those found in insulin coma (Chauchard, P., *Rev. neurol.*, **73**, 245 (1941), Chauchard, B. and P., Mazoué, H., and Lecoq., R., *Compt. rend. soc. biol.*, **137**, 653 (1943)). Attention is called to the fact that the insulin cure of Sakel has the same therapeutic indications as the metrazole cure of von Meduna. Both methods are depressive from a cerebral point of view, and may be contrasted with the pure encephalic excitation observed in strychnine poisoning and B_1 avitaminosis, and with the encephalic depression without peripheral excitation observed in ordinary hypnotic states. M. A. (Chem. Abstr.).

Antagonism between Urethan and Pentamethylenetetrazole (Metrazole) on the Spinal Reflex of the Toad (Bufo chilensis Gay). *Croxatto, H.* [*Anales acad. biol. Univ. catolica Chile*, **8**, 77–81 (1940); *cf. C.A.*, **39**, 355[3].]

The heightening of the crossed spinal reflex produced by metrazole in the toad is neutralized by urethan and *vice versa*. A dose of 3 to 4 mgm. of urethan neutralizes the effect of 5 mgm. of metrazole. WM. M. GOVIER (Chem. Abstr.).

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Biological Test for Metrazole. Espinal, Oscar. [*Rev. med. exptl.* (*Peru*), **8**, 163–70 (1944).]
Metrazole has a convulsion-producing action on *Palemon gaudichaudii*, a shrimp from Peruvian rivers, when solutions are injected into the abdominal muscle, and this animal is more sensitive than higher animals formerly used. The convulsion-producing dose (50 per cent.) is 25 mgm./kgm. and (100 per cent.) 50 mgm./kgm. The sensitivity to metrazole was reduced during the winter. H. L. WILLIAMS (Chem. Abstr.).

The Central Stimulation Produced by Nicotine. Kuschinsky, G., and Hotovy, R. [*Klin. Wochschr.*, **22**, 649–50 (1943).]
Rat experiments showed that nicotine (I) in small doses can cause central stimulation similar in character to that produced by caffeine or pervitin. In stimulated animals (I) often appears to have a transitory sedative action. These experiments favor the view that smoking is done, not in spite of, but because of the (I). RUTH BERGGREN (Chem. Abstr.).

The Value of CO_2 in Counteracting the Effects of Low O. Gibbs, F. A., Gibbs, E. L., Lennox, W. G., and Nims, L. F. [*J. Aviation Med.*, **14**, 250–61 (1943).]
A study of arterial and internal jugular blood and of brain function in eight healthy young men who breathed mixtures containing low percentages of O and varying ratios of N and CO_2 indicated that normal brain function can be maintained in spite of low O in inspired air (as low as 2 per cent.), provided the CO_2 tension of the body is maintained. The addition of CO_2 to low O mixtures permitted maximum utilization of the available O because of increased pulmonary ventilation and consequent increased oxygenation of arterial blood, because of peripheral vasoconstriction and cerebral vasodilation (insuring a maximum share of circulating blood to brain), and because of a shift in the hemoglobin dissociation curve. The maintenance of CO_2 tension of the brain was of equal importance for normal brain function. Gross cortical dysfunction, manifested by high-voltage slow activity in the electroencephalogram and by mental confusion, occurred when the CO_2 tension of the brain fell as a result of breathing low O mixtures, even though the O tension of the brain was sufficient to maintain normal brain function. When the O tension of the brain was lowered while the CO_2 tension of the brain was maintained, consciousness was lost without a preceding period of confusion and without the occurrence of high-voltage slow waves in the electroencephalogram. All studies were carried out with the subjects recumbent. The mixtures employed for inhalation were: 10, 8, 6 and 4 per cent. O in N, and 10, 8, 6, 4 and 2 per cent. O plus 5 per cent. CO_2 in N.
MAURICE M. RATH (Chem. Abstr.).

Acute Toxicity of Choline Chloride Administered Intraperitoneally to Rats. Hodge, Harold C. [*Proc. Soc. Exptl. Biol. Med.*, **57**, 26–8 (1944); *cf. C.A.*, **37**, 946[1].]
The amount of choline chloride required to kill the albino rat is greater the more diluted the solution. Expressed as mgm. per 100 gm. body weight the LD50 values are: 29–34 for a solution containing 200 mgm./c.c., 37–38 for 100 mgm./c.c., 41–49 for 40 mgm./c.c. and 59–75 for 20 mgm./c.c. The large doses killed within 5 minutes. Death was preceded by respiratory paralysis, trembling, convulsive movements, salivation and hemorrhage around the eyes. Rats which survived 20 minutes after injection of any dose invariably lived and showed no symptoms of damage on the days following. L. E. GILSON (Chem. Abstr.).

Paralysis after Tritolyl Phosphate Poisoning. Braun, Ernst. [*Deut. med. Wochschr.*, **70**, 118–20 (1944).]
Numerous persons were poisoned by tri-o-tolyl phosphate mistaken for edible oil. The paralysis and other symptoms described were similar to those reported by numerous previous investigators. L. E. GILSON (Chem. Abstr.).

Direct Measurements on the Effects of Bromides, Sodium Amytal and of Caffeine in Man. Jacobson, Edmund. [*Ann. Internal Med.*, **21**, 455–68 (1944).]
If suitable electrodes are placed in neuromuscular regions, direct measurements can be obtained of the effects of stimulants, sedatives or other types of medication, in terms of action potentials. Measurements are best made with the integrating neurovoltmeter. Bromides by mouth in 1 gm. doses have little effect on normal individuals. Doses of 6 gm. in 2 hours gave diminished potentials in some individuals. Intramuscular injection of 0·17 gm. of Na amytal produced a greater quieting effect. Caffeine Na benzoate in 0·5 gm. intramuscular doses produced no effect in some cases, but was definitely stimulating in others.
JOHN T. MYERS (Chem. Abstr.).

Action of Curare on the Autonomic Neuroeffector Systems. Luco, J. V., and Mesa, J. [*Rev. med. y alimentación* (*Santiago, Chile*), **5**, 60 (1942–43).]
The effect of curare on automatically stimulated systems was studied, separating the pre- and post-ganglionic synaptic fibers, and measuring the variations in diameter of the pupil and contractions of the nictitating membrane. Adrenalectomy was performed to prevent adrenaline modifying the diameter of the pupil. Curare paralyzed the effectors studied against preganglionic synaptic or parasympathetic stimulation (cholinergic). Curare in doses 3–5 times that required to arrest respiratory movements caused partial dilatation of the pupils when it is injected during the stimulation of the post-ganglionic parasympathetic fibers (cholinergic). In contrast no

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effect was observed during stimulation of the post-ganglionic sympathetic fibers (adrenergic), or during direct stimulation of the muscles of the pupil, from which data it is concluded that curare action is manifest only in effectors innervated by cholinergic fibers.

H. L. WILLIAMS (Chem. Abstr.).

Anesthetic Action of, and Reflex Activity of, the Spinal Medulla to Steroid Hormones in the Toad (Bufo chilensis Gay). Croxatto, H., and González, M. [*Rev. med. y alimentación (Santiago, Chile)*, **5**, 71–3 (1942–43).]

DCA, progesterone and testosterone in oil injected into the lymphatic sac or peritoneal cavity of toads weighing 32–48 gm. caused a profound state of anesthesia in doses of 7–10, 5·5 and 10 mgm. or more, respectively, a condition lasting 6–8 or more hours. All these hormones produce total or partial inhibition of the transverse extensor reflex. After the first few hours this reflex could be found after intraventricular injection of eserine salicylate, prostigmine or metrazole. The cholinesterase activity of the 3rd and 4th medullary segments removed during the condition of anesthesia showed a 20 per cent. increase. H. L. WILLIAMS (Chem. Abstr.).

Effect of Narcotics on Cholinesterase Activity. Experiments in vitro by Sheiner's Method. Mikhel'son, M. Ya. Farmakol. i Toksikol., **6**, No. 5, 49–51 (1943); *cf. Bull. biol. med. exp. U.R.S.S.*, **11**, No. 3, 230 (1941).]

The capacity of various narcotics to inhibit cholinesterase activity of biological fluids and tissue extracts parallels their narcotic activity; they produce an inhibition *in vitro* in concentrations similar to that required in blood and tissue to produce narcosis. The serum cholinesterase activity (horse) is decreased 50 per cent. by MeOH (0·26 M), EtOH (0·069 M), PrOH (0·0084 M), iso-BuOH (0·00757 M), isoamyl alcohol (0·00373 M) and chloroform (0·00627 M); and diethyl ether (concentration 0·0135 mol./1) produces 33 per cent. inhibition.

H. L. WILLIAMS (Chem. Abstr.).

High Frequency Electric Current in the Treatment of Alcoholic Hallucinosis. Gruenberg, K. Y. [*Amer. Rev. Soviet Med.*, **1**, 544–52 (1944).]

The beneficial effects of high frequency electric current on schizophrenic patients whose predominant syndrome was of a delusional nature suggested to the author the use of the same therapy for alcoholic hallucinosis. Ten cases of the latter type were studied, and three case-histories are presented. The general effect of the treatment was an alleviation or removal of the hallucinatory syndrome, but there was a tendency for spontaneous recurrence of the symptoms. The possible therapeutic mechanisms of the action of high-frequency current are discussed as well as the question of the possible focal origin of hallucinations.

L. C. MEAD (Psychol. Abstr.).

Treatment of Typhic Hemorrhagic Meningo-encephalitis by Intravenous Injection of Ascorbic Acid. Libov, A. L. [*Sovet. Med.*, **6**, *Nos.* 11/12, 20–1 (1942).]

Whereas after usual methods of treatment 12 of 15 patients died of the disease, following the injection of 12 ml. of a 5 per cent. solution of ascorbic acid the mortality was but 1 patient in 15.

H. L. WILLIAMS (Chem. Abstr.).

Pyridinesulfonamide and Some Agents Acting on the Autonomic Nervous System. Steffenoni, Sergio. [*Boll. soc. ital. biol. sper.*, **16**, 224–5 (1941); *Chem. Zentr.*, **1**, 564 (1944); *cf. C.A.*, **38**, 1087[8].] L. E. GILSON (Chem. Abstr.).

Lactic Acid Content of the Brain after Insulin and Electric Shock. Lups, S. [*Nederland Tijdschr. Geneeskunde*, **87**, 1421–5 (1943); *Chem. Zentr.*, **1**, 559 (1944).]

In albino rat brain lactic acid decreased after large doses of insulin and after electric shock severe enough to produce prolonged tetany. L. E. GILSON (Chem. Abstr.).

Complications Through Treatment with Sulfanilamide Preparations, with Involvement of the Peripheral Nerves. Enneking, J. A. M. J., and Prick, J. J. G. [*Acta Med. Scand.*, **117** 313–33 (1944).]

Marked polyneuritic effects from therapy with sulfanilamide preparations are described in a number of patients. To study this complication to better advantage ultraseptyl (sulfamethylthiazole) was given intramuscularly to a pigeon and the development of paresis was studied until death resulted. Histological examination revealed extensive peripheral nerve degeneration.

S. MORGULIS (Chem. Abstr.).

Effect of Curare and Curare-like Substances on the Central Nervous System. Pick, Ernest P., and Unna, Klaus. [*J. Pharmacol.*, **83**, 59–70 (1945).]

When injected into the thoracic lymph sac, cryst. d-tubocurarine, dihydro-β-erythriodine, quinine ethochloride, nicotine and thiamine inhibited the electric activity of the frog brain. Prostigmine, which itself depresses brain potentials, failed to influence the effect of these substances on the brain potentials, although it counteracted their effects on the neuromuscular junction. Prostigmine partially inhibited the electric activity of frog brain; a subsequent injection of acetylcholine suppressed the electric activity completely. CH_2ICOOH and NaCN abolished the brain potentials of pithed frogs. These results are interpreted as an inhibition of central synaptic transmission by curare and substances with a curare-like action.

L. E. GILSON (Chem. Abstr.).

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The following names are printed in SMALL CAPITALS: authors of original articles and of books reviewed. Names of authorities referred to in the text are in ordinary type.

(R.) indicates a *Review*; the title of the book reviewed is followed by the author's name, thus: "Psycho-analysis and its Derivatives, by H. Crichton-Miller (R.)."

(E.) indicates the *Epitome* section; the title of the abstract is followed by the author's name, thus: "Age and human ability. Miles, W. R. (E.)."

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